

3.3 Climate Variability / Change and Marine Ecosystem Resources in Hudson Bay

Summary

Project Leader(s)

Gosselin, Michel

The Climate Variability/Change and Marine Ecosystem Resources in Hudson Bay subproject will quantify the response of the marine ecosystem to climate-induced variability and change in sea temperature, the timing of the river freshet and ice cover dynamics as documented in projects 3.1 and 3.2. In collaboration with projects 3.4, the impacts of climate forcing on biogeochemical fluxes, biological production, fish recruitment and marine mammal distribution will be addressed. The overarching objective of the project is to assess how climate-induced variability and change in sea temperature, sea-ice cover dynamics (project 3.1) and the timing and intensity of river freshet (project 3.2) affect marine biological productivity, fish stocks and marine mammals in Hudson Bay. Previous landbased studies of the inshore-offshore coastal gradient in biological productivity have demonstrated the central importance of under-ice river plumes in determining primary production, zooplankton dynamics and the feeding success and survival of fish larvae in this immense estuarine system. The oceanography of central Hudson Bay has yet to be studied in detail. In particular, the reach of river plumes (and their ecological impacts) into central Hudson Bay in spring is unknown. To fill these gaps, project 3.3 will repeat coastal observations of primary production and zooplankton and extend them to the offshore zone. This will enable us to assess the extent of the effect of climate-induced modifications of the hydrologic and sea ice annual cycles on Hudson Bay as a whole.

People

Network Investigators

Barber, David G. (University of Manitoba)

Ferguson, Steven (University of Manitoba)

Fortier, Louis (Université Laval)

Gagné, Jacques (Université Laval)

Gosselin, Michel (Université du Québec à Rimouski)

Gratton, Yves (Institut national de la recherche scientifique - Eau, Terre et Environnement)

Hammill, Mike (Université du Québec à Rimouski)

Larouche, Pierre (Université du Québec à Rimouski)

Michel, Christine (University of Manitoba)

Poulin, Michel (Université du Québec à Rimouski)

Power, Michael (University of Waterloo)

Price, Neil (McGill University)

Simard, Yvan (Université du Québec à Rimouski)

Tremblay, Jean-Eric (Université Laval)

Collaborators & Research Associates

Bailleul, Frédéric

Belt, Simon T (University of Plymouth)

Massé, Guillaume (University of Plymouth)

Post-Doctoral Fellows

Mei, Zhi-Ping (Université du Québec à Rimouski)

Mundy, CJ (Christopher John) (Université du Québec à Rimouski)

PhD Students

Benoit, Delphine (Université Laval)

Forest, Alexandre (Université Laval)

Gagnon, Jonathan (Université Laval)

Lafrance, Pascale (Université Laval)
Lapoussière, Amandine (Université du Québec à Rimouski)
Martin, Johannie (Université Laval)
Thanassekos, Stephane (Université Laval)

Masters Students

Forest, Alexandre (Université Laval)
Lapoussière, Amandine (Université du Québec à Rimouski)
Lewis, Adam (University of Waterloo)
Martin, Johannie (Université Laval)
Proteau, Kary (Université du Québec à Rimouski)
Seguin, Emmanuelle (Université du Québec à Rimouski)
Toujani, Ammed (Université du Québec à Rimouski)

Undergraduate Students

Canuel, Pierre (Université Laval)

Technical Staff

Cloutier, Hélien (Université Laval)
Cubaynes, Hannah (Université du Québec à Rimouski)
Desjardins, Isabelle (Université du Québec à Rimouski)
Duluc, Céline
Ferland, Joannie (Université du Québec à Rimouski)
Gagnon, Jonathan (Université Laval)
Jose, Caroline (Université du Québec à Rimouski)
Lamarre, Jean-François (Université du Québec à Rimouski)
Lebel, Simon (Université Laval)
Lemaire, Nicolas (Université du Québec à Rimouski)
Letourneau, Louis (Université Laval)
Piot, Adéline (Université du Québec à Rimouski)
Prokopowicz, Anna
Ringuette, Marc (Université Laval)
Rondeau, Jean-Guy (Fisheries and Oceans Canada - Maurice Lamontagne)
Simard, Mélanie (Université du Québec à Rimouski)
Taillon-Richard, Phébée
Tremblay-Daoust, Ariane (Université du Québec à Rimouski)

Project Staff

Kommick, Nicholas (Université du Québec à Rimouski)
Michaud, Luc (Université Laval)

Partners

IPY Federal Program Office
Université Laval
Indian and Northern Affairs Canada - Northern Scientific Training Program
Institut des sciences de la mer de Rimouski
Fisheries and Oceans Canada - Freshwater Institute
Nunavik Research Center
Fisheries and Oceans Canada - Maurice Lamontagne Institute
Canadian Museum of Nature

Publications

Articles Published in Refereed Publications

Hammill, M.O., Lesage, V., Gosselin, J.-F., Bourdages, H., de March, B.G.E. and Kingsley, M.C.S., 2006, Changes in abundance of northern Quebec (Nunavik) beluga, Arctic, v. 57, 183-195, Published

Laidre, K.L., Stirling, I., Lowry, L.F., Wiig, Ø., Heide-Jørgensen, M.P. and Ferguson, S.H., 2006, Quantifying the sensitivity of Arctic marine mammals to climate-induced habitat change, Ecological Applications, 1, Accepted

Ferguson, S.H., and Higdon, J.W., 2006, How seals divide up the world: environmental, life-history, and conservation, Oecologia, v.150, 318-329, Published

Ferguson, S.H., 2006, The influences of environment, mating habitat, and predation on evolution of pinniped lactation strategies, Journal of Mammalian Evolution, v. 13, 63-82, Published

Ferguson, S.H., Higdon, J.W. and Larivière, S., 2006, Does seasonality explain the evolution and maintenance of delayed implantation in the family Mustelidae (Mammalia: Carnivora)?, Oikos, v. 114, 249-256, Published

Belt, S.T., Massé, G., Rowland, S.J., Poulin, M., Michel, C. and Leblanc, B. A novel chemical fossil of palaeo sea ice: IP25. Organic Geochemistry 38:16-27., 2007, A novel chemical fossil of palaeo sea ice: IP25. , Organic Geochemistry, v. 38, 16-27, Published

Other Refereed Contributions

Saucier, F.-J., Zakardjian, B., Laprise, R., Starr, M., Simard, Y., Desrosiers, G., Plourde, S., Gilbert, D., Gosselin, M., Savenkoff, C., Castonguay, M., Archambault, P., Scarratt, M., Gagné, J., Ouellet, P., Sourisseau, M., Sibert, V., Le Fouest, V., Maps, M., Defosse, M., Larouche, P., Harvey, M., Therriault, J.-C., Demers, S., Chifflet, M., Smith, G., Swain, D., Chabot, D. and Runge, J., 2006, Effects of climate variability and change on the ecosystems of the sub-Arctic inland seas of Canada: The Gulf of St. Lawrence and Hudson Bay, ESSAS 2005 Annual Congress, Victoria, BC, 16-20 May, N/S, Published

Belzile C., Gosselin, M., Ferland, J. and Simard, M., 2006, First flow-cytometric determination of picophytoplankton abundance in the Hudson Bay and adjacent waters: unexpected dominance by picocyanobacteria., International Society for Analytical Cytology XXIII Congress, Quebec, QC, 20-24 May (Poster presentation), 1, Published

Poulin, M., Massé, G., Belt, S., Rowland, S., Michel, C. and LeBlanc, B. , 2006, IP25, a new proxy from diatoms for historical sea-ice variations, 19th International Diatom Symposium, Listvyanka, Russia. 28 August-3 september (Poster presentation), 1, Accepted

Lapoussière, A., Michel, C., Gosselin, M. and Poulin, M. , 2007, Spatial variations in the sinking export of organic material in the Hudson Bay Complex, Gordon Research Conferences: Polar Marine Science, Ventura, CA, 25-30 March (Poster presentation), 1, Accepted

Ferland, J., Gosselin, M., and Starr, M. 2007, 2007, Spatial distribution of phytoplankton production and biomass in the Hudson Bay Complex in summer 2004 and 2005, Canadian Meteorological and Oceanographical Society, Canadian Geophysical Union, and American Meteorological Society, John's, Newfoundland, 28 May-1 June, 1, Published

Sibert, V., Zakardjian, B., Saucier, F.J. and Gosselin, M., 2007, Ice algae and plankton production in a 3D sea-ice-ocean model of the Hudson Bay, Hudson Strait and Foxe Basin environments, Arctic Frontiers Conference, University of Tromsø, Tromsø, Norway, 23-26 January, 1, Published

Non-Refereed Contributions

Gosselin, M., Simard, M., Ferland, J., Saucier, F. and Starr, M. , 2006, Spatial variability of the phytoplankton biomass and production in the Hudson Bay system in summer 2004, Gordon Research Conferences: Polar Marine Science, Ventura, CA, 13-18 March, N/S, Accepted

Larouche, P., Cizmeli, S. and Guillot, P., 2006, Hudson Bay chlorophyll spatio-temporal variability as estimated using SeaWiFS data, ArcticNet Annual Scientific Meeting, Quebec City, QC, 5-8 December, N/S, Accepted

Sibert, V., Zakardjian, B., Saucier, F., Chifflet, M. and Dubreuil, A., 2006, A coupled 3D ice-ocean-ecosystem (with ice-algae) model of Hudson Bay, Foxe Basin and Hudson Strait, ArcticNet Annual Scientific Meeting , Quebec City, QC, 5-8 December, N/S, Accepted

Mei, Z.-P., Azetsu-Scott, K., Gosselin, M. and Pommier, J., 2006, Seasonal variations in the uptake of atmospheric CO₂ in different biogeochemical provinces of the Northwest Atlantic Ocean, Proceedings ArcticNet 2004 Annual Scientific Meeting, 51, Accepted

Adams, S., and Bose, N., 2006, Beluga-Below the ice environmental laboratory using an AUV., Second ArcticNet Annual Scientific Meeting, Banff, 13-16 December, 1, Accepted

Gosselin M., Simard, M., Ferland, J., Saucier, F. and Starr, M., 2006, Spatial variability of the phytoplankton biomass and production in the Hudson Bay system in summer 2004., Second ArcticNet Annual Scientific Meeting, Banff, 13-16 December., 1, Accepted

Lapoussière, A., Michel, C., Poulin, M. and Gosselin, M., 2006, Vertical sinking export of organic material in Hudson Bay during the fall 2005., Second ArcticNet Annual Scientific Meeting, Banff, 13-16 December, 1, Accepted

Lewis, A., Hammill, M. O., Doidge, D. W., Power, M. and Lesage, V. , 2006, Comparing summer distribution of beluga whales (*Delphinapterus leucas*) using Traditional Ecological Knowledge (TEK) and satellite telemetry., 16th Biennial Conference of the Society for Marine Mammals, San Diego California, December 12-16, 1, Accepted

Martin, J. and Tremblay, J.-É. , 2006, Structure and dynamics of deep chlorophyll maxima in the Canadian Arctic, Second ArcticNet Annual Scientific Meeting, Banff, 13-16 December, 78, Accepted

Proteau, K., Michel, C., Poulin, M., LeBlanc, B. and Gosselin, M., 2006, Influence of a river plume on ice algal communities in southwestern Hudson Bay in spring 2005., Second ArcticNet Annual Scientific Meeting, Banff, 13-16 December., 1, Accepted

Séguin, E., Hammill, O., Lesage, V. and Guillemette, M., 2006, Diving activity of eastern Hudson bay belugas (*Delphinapterus leucas*) in relation to the diving lactate threshold., Second ArcticNet Annual Scientific Meeting , Banff, 13-16 December, 1, Accepted

Séguin, E., Hammill, M. O., Lesage, V. and Guillemette, M., 2006, Diving activity of eastern Hudson Bay belugas (*Delphinapterus leucas*) in relation to the diving lactate threshold., 16th Biennial Conference of the Society for Marine Mammals, San Diego California, 12-16 December, 1, Accepted

Tremblay, J.-É., 2006, Implications of environmental change for primary production and the flow of biogenic carbon in the Arctic Ocean., Oral presentation at the Arctic Science Summit Week 2005, Kunming, China, 17-22 April, 1, Published

Mei, Z.-P., Zakardjian, B., Saucier, F., Senneville, S., Azetsu-Scott, K., Gosselin, M. and Xie, H., 2006, A 3-D coupled physics-CO₂ flux model of the Hudson Bay system: a dark ocean experiment, 2005 ArcticNet Annual Science Meeting, Banff, AB, 13-16 December, 1, Accepted

Gosselin, M., Simard, M., Ferland, J., Saucier, F. and Starr, M., 2006, Spatial variability of the phytoplankton biomass and production in the Hudson Bay system in summer 2004, 2005 ArcticNet Annual Science Meeting, Banff, AB, 13-16 December, 1, Accepted

Simard, Y., Fortier, L., Gagné, J., and Benoit, D., 2006, Fish and zooplankton distribution along the Amundsen track through the Arctic and Hudson Bay as revealed by multifrequency acoustic backscattering, Second ArcticNet Annual Scientific Meeting, Banff 13-16 December, 1, Published

Benoit, D., Simard, Y., and Fortier, L., 2006, The Arctic cod biomass paradigm, Réunion Annuelle du regroupement FQRNT Québec-Océan. Rivière du Loup. 16-17 nov., 1, Published

Larouche, P. and Coulombe, R., 2006, Spatial structures in Hudson Bay: a first look at the Amundsen along-track system data during Arcticnet 2005 and implications for remote sensing applications, 2005 ArcticNet Annual Conference Proceedings, 72, Published

Gagnon, J. and Tremblay, J.-E., 2006, Nitrogen cycling and micro-algal production in the Canadian Arctic, 2006 ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.61, Accepted

Lapoussière, A., Michel, C., Gosselin, M. and Poulin, M., 2006, Spatial and temporal variations in the sinking export of organic material in the Hudson Bay System, ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.77, Accepted

Lewis, A., Hammill, M.O., Power, M., Doidge, D.W. and Lesage, V., 2006, Sex related differences of Beluga whale (*Delphinapterus Leucas*) home ranges in Eastern Hudson Bay, Canada, ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.79, Accepted

Michel, C., Lapoussière, A., Leblanc, B. and Starr, M., 2006, Transparent exopolymeric substances (TEP) in Hudson Bay during the fall: significance and potential roles, 2006 ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.84, Accepted

Séguin, E., Lesage, V. and Guillemette, M., 2006, Diving Behaviour on the summering ground of Eastern Hudson Bay Belugas (*Delphinapterus Leucas*) in comparison with diving in other migratory phases, 2006 ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.99, Accepted

Thanassekos, S. Fortier, L. and Dupont, S., 2006, Modelling growth and survival of Arctic cod, 2006 ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.104, Accepted

Tremblay, J.-É. and Gagnon, J., 2006, Nutrient investigations in ArcticNet: tracking changes in ocean circulation at the hemispheric and regional scale, 2006 ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p.106, Accepted

Simard, M., Tremblay, G. and Gosselin, M., 2006, Spatial variability of the phytoplankton biomass and production in the Canadian High Arctic, 2006 ArcticNet Annual Scientific Meeting, Victoria, BC, 12-15 December, p. 99, Accepted

Massé, G., Belt, S.T., Rowland, S.J., Poulin, M., Sicre, M. and Michel, C., 2006, Novel highly branched isoprenoid biomarkers as indicators of sea-ice diatoms: implications for historical sea-ice records and future predictions, American Geophysical Union, Fall Meeting, San Francisco, CA, 11-15 December (Oral presentation), 1, Accepted

Lapoussière, A., Michel, C., Poulin, M. and Gosselin, M., 2007, Variability in the Sinking Export of Organic Material in Hudson Bay and Hudson Strait during the Fall, ArcticNet Scientific Meeting, Collingwood, ON, 11-14 December, 70, Published

Mundy, C.J., Gosselin, M., Starr, M. and Michel, C., 2007, Riverine export and the effects of circulation on dissolved organic carbon in the Hudson Bay System, Canada, ArcticNet Scientific Meeting, Collingwood, ON, 11-14 December, 1, Published

Lalande C., Valdenaire, B., Forest, A., Fortier, L., 2007, Seasonal Variations of Vertical Fluxes of Particulate Organic Carbon in Coastal Hudson Bay: First Insights from 2005-2006, 2007 ArcticNet Annual Conference Proceedings, 93, Published

Specialized Publications

Poulin, M., 2006, Ice aboriginals, Science, First Hand, v. 5, no. 10, 25, 47, Published

Harvey, M., Starr, M., Therriault, J.-C., Saucier, F.J. and Gosselin, M., 2006, MERICA-Nord Program: Monitoring and research in the Hudson Bay Complex. , AZMP Bulletin PMZA, v. 5, 27-32, Published