The Arctic cod (*Boreogadus saida*) ecosystem under the double pressure of climate change and industrialization

**Summary**

**Project Leader**
Fortier, Louis

The Arctic cod (*Boreogadus saida*), also known as the polar cod in Europe, is a key component of the Arctic Ocean pelagic ecosystem that effects up to 75% of the energy transfer between the plankton and the vertebrate fauna (fish, seals, whales and marine birds). Being an hyper-specialist adapted to life in ice-covered seas, Arctic cod is likely to be displaced by southern generalists such as the capelin and the sand lance as the ice regime becomes less severe. This project collaborates closely with ‘Hotspots’, ‘Moorings’ and ‘Sea-ice’ to map the distribution and migrations of Arctic cod populations in the Canadian Arctic, and to measure variations in hatching season and early growth in relation to annual changes in ice regime, surface temperature, and zooplankton prey abundance. In partnership with the Department of Fisheries and Oceans, and the Department of Aboriginal Affairs and Northern Development (Beaufort Regional Environmental Assessment program), we assess the general distribution and reproduction of Arctic cod in the Beaufort Sea and its response to climatic and anthropogenic pressures.

**People**

**Network Investigators**
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ArcticNet Phase 3 Projects (2011-2015) / Arctic Cod
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Partners
Aboriginal Affairs and Northern Development Canada
BP Exploration Operating Company Ltd
BREA/AANDC
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Canadian Scientific Submersible Facility

Publications

Articles Published in Refereed Publications

Benoit, D., Simard, Y. and Fortier, L., 2014, Pre-winter distribution and habitat characteristics of polar cod (Boreogadus saida) in southeastern Beaufort Sea., Polar Biology. 37, 149-163, Published

Bouchard, C., Fortier, L., 2011, Circum-arctic comparison of the hatching season of polar cod (Boreogadus saida); a test of the freshwater winter refuge hypothesis, Progress in Oceanography, v.90, 105–116, Published


Darnis, G. and L. Fortier. I, 2014, Temperature, food and the seasonal vertical migration of key arctic copepods in the thermally stratified Amundsen Gulf (Beaufort Sea, Arctic Ocean), Journal of Plankton Research, , Accepted


Deming, J., Fortier, L., 2011, Introduction to the special issue on the biology of the circumpolar flaw lead (CFL) in the Amundsen Gulf of the Beaufort Sea (Arctic Ocean), Polar Biology, v.34, no.12, 1797-1801, Published


Deming J., Fortier, L., 2011, Introduction to the special issue on the biology of the circumpolar flaw lead (CFL) in the Amundsen Gulf of the Beaufort Sea (Arctic Ocean)., Polar Biology, v.34, no.12, 1797-1801, Published


Geoffroy, M., Majewski, A., Gauthier, S., LeBlanc, M., Walkusz, W., Reist, J.D., and Fortier, L., 2014, Target Strength, vertical distribution and migrations of pelagic fish in the Canadian Beaufort Sea from spring to fall, Polar Biology, , Submitted

Geoffroy, M., Robert, D., Darnis, G., Fortier, L., 2011, The aggregation of polar cod (Boreogadus saida) in the deep Atlantic layer of ice-covered Amundsen Gulf (Beaufort Sea) in winter, Polar Biology, v.34, no.12, 1959-1971, Published


Thanassekos S., Fortier, L., 2012, An individual based model of Arctic cod (Boreogadus saida) early life in Arctic polynyas: I. Simulated growth in relation to hatch date in the Northeast Water (Greenland Sea) and the North Water (Baffin Bay), Journal of Marine Systems, v.93, 25-38, Published


Other Refereed Contributions


Non-Refereed Contributions

Darnis, G., Fortier, L., 2011, Respiration zooplanctonique et exportation du carbone en profondeur dans le golfe d'Amundsen (Océan Arctique), Annual General Meeting of Québec-Océan, Lac Delage, Québec, 17 November, Accepted

Darnis, G., Fortier, L., 2011, Zooplankton respiration and the export of carbon at depth in the Amundsen Gulf (Arctic Ocean), High latitude pelagic and ice ecosystems meeting, University of Tromso, Tromso, 31 October, Accepted


Fortier L., 2012, Changing Arctic ecosystem services: from knowledge to decision at regional and local scales, Invited plenary lecture. International Polar Year Montreal Conference 2012, Montreal, Accepted

Geoffroy, M., Rousseau, S. PyC, C., Fortier, L., 2011, Utilisation d'un sonar halieutique (Simrad SX90) pour l'étude des niveaux trophiques supérieurs de l'écosystème marin arctique, Assemblée générale annuelle de Québec-Océan, Lac Delage, 17-18 November, Accepted

Geoffroy, M., Rousseau, S., PyC, C., Fortier, L., 2011, Searching for the missing cod using hydroacoustic technology, Beaufort Regional Environmental Assessment (BREA) Day, Inuvik, 5 December, Accepted


Pyc, C., Geoffroy, M., Rousseau, S., Reier Knudsen, F., Gammelseter, O.B., Levesque, K., Fortier, L., 2011, Canadian Beaufort Sea Active Acoustics Research project, BP external advisory panel meeting, Tampa, 24 November, Accepted
Robert, D., Falardeau, M., Suzuki, K., Fortier, L., 2011, Investigating trophic interactions between larval Arctic cod (Boreogadus saida) and their zooplankton prey in the rapidly warming Beaufort Sea, 35th Annual Larval Fish Conference, Wilmington, 24 May, Accepted

Specialized Publications

Benoit, D., 2012, Océanographie, distribution et cycle annual de la more arctique (Boreogadus saida) en mer de Beaufort: une approche hydroacoustique, Ph.D. thesis, Université Laval, Canada, Accepted

Robert, D., Grant, C., Gagnon, J., 2011, Data from the environment and marine resources assessment of Imperial Oil/BP Exploration License Areas 446, 449, 451 and 453 (Beaufort Sea), in the summers of 2009, 2010 and 2011, Québec, Canada, 74 pp., Published

Thanassekos, S., 2011, Modélisation individu-centrée de la croissance et de la survie larvaire de la morue arctique (Boreogadus saida) dans deux polynies, Ph.D. thesis, Université Laval, Canada, 114 pp., Published