Government of Canada / Gouvernement du Canada

Climate Change IMPACTS and ADAPTATION Program

Fisheries

The overarching goal of the Climate Change Impacts and Adaptation Program is to reduce Canada's vulnerability to climate change. Through a competitive proposal process, the research program supports cost shared research to address gaps in our knowledge of Canada's vulnerability to climate change and to provide information for adaptation decision-making. Additional emphasis is placed on research that examines processes, barriers, and drivers for adaptation.

The program also supports the Canadian Climate Impacts and Adaptation Research Network (C-CIARN). This network facilitates linkages between stakeholders and researchers, promotes new research techniques and methodologies, disseminates information, and provides a voice for an emerging impacts and adaptation research community.

Between 1998 and 2001, the Impacts and Adaptation component of the Government of Canada's Climate Change Action Fund supported over 75 projects to examine the impacts of climate change on Canadians and the processes by which we adapt. Nine of these projects related to fisheries and ranged from addressing questions of the impact of climate change on the reproduction and distribution of snow crab in Eastern Canada to adaptation options for freshwater fisheries that address potential changes in sustainable yields.

adaptation.nrcan.gc.ca

Canada

Here are some brief highlights of the projects funded.

Freshwater Ecosystems

1. Impact of Climate Change on River Water Temperature and Fish Growth

Using 30 years of data, researchers examined the relationships between climate, hydrologic parameters, and the fork length of juvenile salmon in the Miramichi River. Fork length is an indicator of growth, which also affects competition, predation, smoltification, and marine survival of salmon. In association with the warming observed over the time period studied, fork length of juvenile salmon parr was found to have declined significantly. As such, researchers suggest that future climate change would adversely affect the growth of juvenile salmon in the Miramichi freshwater portion of their life cycle, which would increase juvenile mortality rates.

Principal Investigator: Nassir El-Jabi
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2. Freshwater Fisheries in Ontario

This study used historic data and climate models to determine the potential impacts of climate change on two economically important sport fish in Ontario. Researchers examined how climate change would affect sustainable yields and angling efforts of walleye, and the northern zoogeographic boundary of smallmouth bass. They found that sustained yield of walleye would generally increase in northern and central Ontario, and decrease in southern Ontario. To adapt to future changes, fisheries managers may look for trade-off options between cold, cool, and warm water fishery components (e.g., shift angling from cold to warm water fish species).

Principal Investigator: Ken Minns
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3. The Impact of Climate Change on the Thermal Structure of Boreal Forest Lakes and its Potential Impact on Important Fish Communities

Using data from the Experimental Lakes Area (ELA) in northwestern Ontario, researchers modelled the impact of different climate change scenarios on the thermal regime of lakes in the region. They found that climate warming would affect the timing and characteristics of lake stratification and ice cover, with resultant consequences for fish thermal habitat. Spatial and temporal shifts in thermal niche space are expected to affect the feeding patterns, productivity and reproduction of fish such as yellow perch and lake trout.

Principal Investigator: Dr. Ray Hesslein
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4. Evaluating the Sensitivities of Boreal Forest Lakes to Climatic Change

This study examined climatic sensitivities of boreal forest lakes at the Experimental Lakes Area (ELA) in northwestern Ontario. Using historic ELA data, climate change was found to potentially interfere both physically and chemically with the recovery of boreal lakes from acidification. Preliminary experimental research also suggested that some forms of dissolved organic carbon could enhance in-lake buffering of acidity. Another experiment demonstrated that increased water temperatures would modify near-shore food webs and productivity. Researchers also enhanced the ELA database, enabling continuing analysis of climatic factors controlling climatically related declines in lake concentrations of dissolved organic carbon.

Principal Investigator: Michael Turner
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5. Extreme Climate Events in the Boreal Shield Lakes

Researchers established a network of aquatic research sites in the Boreal Shield ecozone, and used long-term aquatic databases to investigate how changes in temperature and precipitation impact water temperatures, plankton richness and biomass, phytoplankton communities, and water chemistry (e.g., acidity). The study found that annual patterns in air and water temperature were comparable across regions and that there were subsets of lakes where plankton richness and biomass varied in a similar manner through time. This suggests that there may be regional-level effects of climate on lake biota, although they are probably modified by individual lake characteristics. In addition to their primary results, researchers identified five priorities for future climate research in Boreal Shield lakes.

Principal Investigator: Dr. Shelley Arnott
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Marine Ecosystems

6. Impact of Climate Change on Toxic Phytoplankton Blooms and Shellfish Toxicity

To determine the role of climate on the development and intensity of toxic algal blooms, researchers analyzed 10 years of hydrological, biological and meteorological data. They found that the development of blooms was favoured by high run-off from local tributary rivers, combined with prolonged periods of low winds, while more intense algal outbreaks were associated with extreme climate events, such as heavy rainfall. If conditions such as these become more common in the future, we can expect to see an increase in the onset and proliferation of toxic algal blooms in eastern Canada.

Principal Investigator: Maurice Levasseur
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7. Effects of a Warmer Ocean Climate Under a Doubled CO_2-Atmosphere on the Reproduction and Distribution of Snow Crab in Eastern Canada

Researchers found that small changes in temperature could have significant impacts on snow crab reproduction, development and distribution in Eastern Canada. This is especially true for snow crab populations located on the Eastern Scotian Shelf and the Grand Bank of Newfoundland. Changes in water temperature were found to impact the survivorship and long-term growth of juveniles, influence the distribution of different age-classes of snow crab, and affect the amount of time that females incubate their eggs.

Principal Investigator: Denis Gilbert
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8. The Effect of Recent Climate Change on the Early Marine Growth Rates of Juvenile Salmon in the Strait of Georgia

The amount and type of food consumed by young fish are known to be particularly important factors that affect their growth rates. Similarly, through its effect on metabolic rates, temperature also plays a key role. This project tested the hypothesis that recent changes in plankton dynamics, coupled with recent increases in water temperature have reduced the growth rates of juvenile salmon in the months following their entry into the Strait of Georgia in British Columbia.

Principal Investigator: Dr John Dower
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9. Impacts on Ringed Seal Distribution

This project set out to investigate the potential impacts of climate change on key ringed seal habitat variables by comparing latitudinal and longitudinal gradients throughout the ringed seals' range, and linking these with pup production and survival. Small changes in climate, such as the timing of snowfall, can influence, when ice forms, how long the ice stays and the amount and duration of snow cover; all of which directly affect the biology of ringed seals. Calm or stormy weather during freeze up, is also important to the quality of seal habitat. Many of these variables are expected to change with climate warming.

Principal Investigator: Dr Rob Stewart
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Further information on the program and funding opportunities can be found on the web site:

adaptation.nrcan.gc.ca

or contact the
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