

Table of Contents

Armellin, Alain	2
Avramescu, Luyza	2
Bailey, Dr. Robert.....	3
Bonnell, Jennifer	3
Bourget, Geneviève	4
Boyer, Claudine	4
Charland, Coralie	5
Choy, Emily Sarah	5
Conn, Dr. D. Bruce.....	6
Crane, Natasha.....	6
de Lafontaine, Yves	7
de Wit, Willy	7
Desrosiers, Mélanie	8
DeWeese, June	9
Schwartz, Carl, Gibbs, Peter, and Farrell, Dr. John	9
Oliveira, Dr. Ken	9
Farrell, John M.	9
Farrell, John M.	10
Fathi, Mahsa	10
Febria, Catherine M.	11
Gillis, Carole-Anne	11
Hodson, Peter V.....	12
Martin, Jonathan	12
Marttila, David.....	13
Marty, Jérôme	13
Marty, Jérôme	14
Mathers, Alastair	15
McCairns, Scott.....	15
Morris, Dr. Joe	16
Patrick, Paul H.	16
Pennuto, Christopher	17
Pettigrew, Pierre	17
Razavi, Roxanne.....	18
Reyjol, Yorick,	18
Richard, Louis-Filip	19
Ridal, Jeff	20
Robin, Melanie	20
Sneyd, Bob	21
Trencia, Guy	21
Twiss, Michael R.....	22
Verhaar, Patrick	22
Verreault, Guy.....	23
White, M.S.	23
Wong, Jessica.....	24
Xenopoulos, M.A.....	24
Young, Charlotte	24

Abstracts

INFLUENCE OF ENVIRONMENTAL FACTORS ON LITTORAL BENTHIC COMMUNITIES OF LAKE SAINT-PIERRE, QUEBEC.

A. Armellin¹, L. Tall², G. Méthot², and B. Pinel-Alloul²

¹ St. Lawrence Center, Environment Canada

² Département de Sciences Biologiques, Université de Montréal

Benthic communities occurring in littoral areas are directly exposed to the conditions of the environment and to pollution-related stresses. However, the effects of the environment on the structure of benthic communities in the littoral ecosystems of the St. Lawrence fluvial lakes are not well understood, mainly due to the tremendous complexity of these ecosystems. Our study is the first step in describing the health of the macroinvertebrate community in Lake Saint-Pierre, with a view to establishing a long-term monitoring program. Sampling covered both the north and south shores of the lake, which are characterized by water masses with contrasting physical and chemical properties: mineralized water from the Ottawa River and loaded with humic acid on the north shore, and low mineralized water from the Great Lakes on the south shore. The spatial distribution of our sampling stations takes account of their exposure to known anthropogenic stresses such as agricultural runoff. In this preliminary study, we compared two sampling methods (i.e. kick nets versus cores), and assessed the spatial variability of benthic communities between replicate and sampling stations by means of a multivariate statistical analysis. The effect of variations in environmental variables (e.g. nutrients, heavy metals and landscape) on the density and taxonomic composition of benthic invertebrate communities was also explored.

Armellin, Alain
Biologist, Biomonitoring Project Leader,
105 McGill
Montréal, Que, H2Y 2E7
Tel: (514) 283-3253
Fax: (514) 496-2676
E-mail: alain.armellin@ec.gc.ca

FACTORS INFLUENCING NET METHYL MERCURY FORMATION IN ZONE 1 SEDIMENTS CORNWALL, ONTARIO

Luyza Avramescu¹, Emmanuel Yumvihoze¹, Jeff Ridal³, David Lean¹, Danielle Fortin¹, Holger Hintelmann²

¹University of Ottawa

²Trent University

³St. Lawrence River Institute of Environmental Sciences

High concentrations of monomethylmercury in fish have triggered a large body of scientific studies and led to major policy decisions related to safe consumption. Our study focuses on the biogeochemical factors that affect NET methylmercury formation, more specifically the role played by methanogens, iron and sulfate reducing bacteria. Methylation and demethylation were measured by using enriched stable isotopes of mercury $^{200}\text{Hg}^{2+}$ and Me^{199}Hg in microcosms treated with specific bacterial inhibitors. Sediments were sampled in July and August 2007 from the St. Lawrence River in Cornwall and incubated in the dark at room temperature in an anaerobic chamber for 96h. The amounts of $\text{Me}^{200}\text{Hg}^+$ produced and $\text{Me}^{199}\text{Hg}^+$ remaining were measured and flux rates calculated. Methylmercury concentrations increased linearly during the first 24h then stopped for all treatments, indicating that the small amount of mercury added was probably the only bioavailable form or that the processes of methylation and demethylation rapidly equilibrated. Stimulation of methylmercury production was observed when methanogens were inhibited, and methylation was only partially limited by sulfate-reducing bacteria inhibition suggesting that iron reducing bacteria might be involved in the methylation process. This information suggests that it would be a mistake to expose these sediments to oxygen as the sulfide concentrations which likely immobilize mercury would be converted to sulfate and liberate the mercury

Avramescu, Luyza
Biology Department
University of Ottawa
30 Marie Curie
Ottawa, ON, K1N 6N5
E-mail: mavra006@uottawa.ca

WHAT'S HAPPENED DOWN ON THE FARM? APPLYING THE REFERENCE CONDITION APPROACH TO BIOASSESSMENT OF GREAT LAKES STREAM AGRO-ECOSYSTEMS.

Bailey, Robert, Adam Yates, Katie Stammer

The Reference Condition Approach (RCA) to bioassessment is based on characterizing the variability of biota among ecosystems that are relatively unexposed to human activity, building a predictive model that relates this variability to that in the natural environment, and using this model to predict what biota should be in an ecosystem exposed to human activity. If it is close to what is expected, the conclusion is that the ecosystem is OK. The challenge of applying RCA in rural streams in the southern Great Lakes basin is the extensive and pervasive human activity. There is no pristine. I will show how we have defined the reference condition in such systems, but also quantified human activity in univariate and multivariate stressor gradients, and examined the relationship between such gradients and biota including fish and macroinvertebrate. Our ultimate goal is to inform management and planning by exploiting the relationship between human activity and the structure of stream biota, using circumstantial but not experimental evidence of the intermediary causes of such relationships.

Bailey, Dr. Robert
Environmental Research Western
Collip Bldg Room 209
The University of Western Ontario
London ON Canada N6A 5B7
voice/fax: (519) 661-4022
E-mail: drbob@uwo.ca

CANADA-NEWFOUNDLAND/LABRADOR AQUA LINK (CANAL)

Jennifer Bonnell

There are many challenges to the effective communication of ambient water-quality-data, especially when sampling programs involve the cooperation of different agencies. This poster presents an innovative application, the Canada-Newfoundland/Labrador Aqua Link (CANAL), which addresses many of these challenges. In CANAL, water-quality- data web services are used in conjunction with the CCME Water Quality Index to deliver ambient water-quality-data, collected from a Federal-Provincial network consisting of 109 sites throughout Newfoundland and Labrador, to Canadians through a public GIS web site. The first application of its kind in the country, it is a prototype concept that could easily be used to bring ambient water-quality-data from other parts of the country to Canadians or be used by other jurisdictions, countries, and international agencies such as the United Nations.

Bonnell, Jennifer
Environmental Scientist
Water Resources Management Division
Department of Environment and Conservation
Government of Newfoundland and Labrador
P.O. Box 8700
St. John's, NL, A1B 4J6
Tel: (709) 729-1157
E-mail: jenniferbonnell@gov.nl.ca

AQUATIC ALIEN INVASIVE SPECIES EARLY DETECTION NETWORK FOR THE ST. LAWRENCE RIVER

Geneviève Bourget

The St. Lawrence System is at high risk from aquatic invasive alien species (AIAS). Main vectors for AIAS are commercial and recreational boating. Alien species that become invasive are a direct driver of biodiversity loss across the globe. Early detection is very important to counter their potential impacts. In 2007, for the first time in St. Lawrence River, the Québec Ministère des Ressources naturelles et de la Faune (MRNF) set up an early detection network to report new and emerging AIAS. To reach that goal, the MRNF coordinates, trains and supports 156 commercial fishermen for detecting AIAS. The network spans on a 300-km long River stretch where overseas vessels use 8 commercial ports for international trade. This area, offers a wide variety of fish habitat with water salinity ranging from 0 to 30 ‰. Fishing gears are very effective for catching fish ranging from 10 to 2000 mm. During the first year, fishermen sampled an estimated 2 500 000 fishes. More than 150 specimens being suspected to be AIAS were collected. Four AIAS were identified: Chinese mitten crab (*Eriocheir sinensis*), Round goby (*Neogobius melanostomus*), Gizzard shad (*Dorosoma cepedianum*) and for the first time in St. Lawrence River the Blueback herring (*Alosa aestivalis*). The early detection network is very effective to collect and identify AIAS in an area with one of the highest potential of establishment. This network allows the detection of AIAS with reduced cost and support. This presentation summarizes the network first year activities.

Bourget, Geneviève
fisheries biologist
Ministère des Ressources naturelles et de la Faune
Direction de l'aménagement de la faune du Bas-Saint-Laurent
186, rue Fraser
Rivière-du-Loup (Québec) G5R 1C8
Tel: (418) 862 8213 ext. 302
Fax: (418) 862-8176
E-mail: genevieve.bourget@mrnf.gouv.qc.ca

IMPACTS OF ENVIRONMENTAL CHANGES ON THE HYDROLOGY AND SEDIMENTARY PROCESSES AT THE CONFLUENCE OF ST-LAWRENCE TRIBUTARIES: POTENTIAL EFFECTS ON FLUVIAL ECOSYSTEMS

Boyer Claudine, Roy, André G., Verhaar Patrick M.

The spatio-temporal variability of environmental changes and the diversity of river systems pose important challenges in forecasting river behaviors. The temperature increases and alterations of the precipitation regime that are projected for the next century will modify the temporal distribution of water supply at the watershed scale. In this study, we have analyzed the impact of six climatic projections for five contrasted tributaries in the St-Lawrence fluvial corridor. Our results show that the greatest hydrological changes will be observed during the winter and spring seasons, a time that is critical for many ecosystems. It is expected that winter mean flow will increase, the timing of spring floods will shift and the spring peak flows will decrease. These changes will occur simultaneously with a lowering of the St-Lawrence water levels and will have significant impacts on the sedimentary processes. At the confluence of the St-Lawrence tributaries a whole range of impacts will be registered. The characteristics of each tributary will modulate the sequence and the amplitude of the river response. The morphological, hydrological and sedimentological characteristics of each tributary, flow dynamics at the river mouth and current channel stability can either speed up or delay the adjustment processes. In this paper, we present the results of a modeling approach used to investigate the diversity of the tributary response. The effects of changing the timing of the St-Lawrence water level and high river discharge on the river mouth evolution and the potential impacts on the fluvial ecosystems are also discussed.

Boyer, Claudine
Département de géographie
Université de Montréal
C.P. 6028 Succ. Centre-Ville
Montréal, Québec
H3C 3J7
Tel.: (514) 343-8035
Fax: (514) 343-8008
Email: claudine.boyer@umontreal.ca

HYDROGEOLOGICAL MODELING OF THE VARS-WINCHESTER ESKER SYSTEM, EASTERN ONTARIO

Charland, C.¹; Robin, M.J.L.¹; Dilorio, T.²

¹ *Department of Earth Sciences, University of Ottawa*

² *South Nation Conservation Authority*

Buried esker systems are a major source of potable water in Eastern Ontario. These important aquifers need to be understood in order for their resources to be properly managed and protected. For this reason, a collaborative project involving the South Nation Conservation Authority, the Geological Survey of Canada, and the University of Ottawa, is currently underway to study the region's eskers. The focus of this work is one esker extending from Vars to Winchester, in the South Nation River watershed. This esker complex is the municipal water source for five villages, with an estimated population of 12,000. The complex is conceptualized as a 50-km long deposit of glaciofluvial outwash high-permeability material that is generally surrounded by fine, low permeability materials, except in a number of locations where the esker outcrops at ground surface. The complex recharges at its northern- and southern-most areas, which correspond to topographic highs; it discharges in a topographically low area at its center near the village of Embrun. Regional stratigraphy was simplified for modeling purposes and brought down to six hydrostratigraphic units, two of which represent the esker: the coarser core, composed of a mixture of coarse sand and gravel, and the sandy fan deposits. This presentation gives preliminary results of our three-dimensional hydrogeological model of the system, developed using FEFLOW, which applies a finite element formulation. This model will be a facilitating tool for understanding the aquifer, contributing to watershed characterization, vulnerability analyses, and ultimately to the development of source water protection plans.

Charland, Coralie
University of Ottawa, Earth Sciences Department
M.Sc. Candidate, hydrogeology
140 Louis-Pasteur (Marion Hall, 117)
Ottawa, ON, K1N 6N5
Tel: (613) 562-5800 Ext. 6417
E-mail: cchar005@uottawa.ca

TEMPORAL AND SPATIAL TRENDS OF MERCURY CONCENTRATION IN YOUNG-OF-THE-YEAR SPOTTAIL SHINERS IN THE ST. LAWRENCE RIVER AT CORNWALL, ONTARIO

Choy, Emily S., Peter Hodson, Linda Campbell, Jeff Ridal, Adrienne Fowlie

Young-of-the-year (YOY) fish can be effective indicators of spatial and temporal distributions of contaminants. In August 2005, YOY spottail shiners (*Notropis hudsonius*) were collected from five sites along the waterfront of the St. Lawrence River at Cornwall "Area of Concern", to assess nearshore concentrations of total mercury (THg). The results and previous data from the Ontario Ministry of the Environment demonstrated total Hg concentrations in spottail shiners to be significantly higher from the contaminated zone than reference sites. Within the contaminated zone, there were significant differences in Hg concentrations among three sites spaced 500 m apart, suggesting a possible internal source of Hg. Although total Hg concentrations in YOY spottail shiners have decreased from 1979 to 2005, there is high year-to-year variability, particularly in the contaminated zone. Stable isotope analyses of spottail shiners did not reveal any differences in nitrogen isotope composition; however, carbon sources at an upstream reference zone were not the same as within the Area of Concern. Differences in carbon isotope composition at two sites within the contaminated zone corresponded to differences in Hg concentrations, consistent with a unique internal source of Hg. The variation in Hg contamination of YOY spottail shiners over fine spatial and temporal scales provide important insights about the potential release of Hg from contaminated sediments and its uptake to the aquatic food web. This presentation outlines the value of long-term monitoring programs to assess the complex interactions of contaminants within aquatic environments.

Choy, Emily Sarah
Master's Candidate
Chemical and Environmental Toxicology Program
Department of Biology
University of Ottawa
30 Marie Curie
Ottawa, ON, K1N 6N5
Tel: (613) 562-5800 Ext. 6018
E-mail: echoy087@uottawa.ca

LONG-TERM MONITORING FOR EPIBENTHIC MACROINVERTEBRATES IN THE ST. LAWRENCE RIVER (1990-2008): A MODEL FOR COMBINING EFFORTS ON THE UPPER AND LOWER RIVER

David Bruce Conn¹, Denise A. Conn².

¹Department of Biology, Berry College, Mount Berry, Georgia, U.S.A, and ²North American Scientific Enterprises (NASCENT), Monteagle, Tennessee, U.S.A.

We have undertaken a long-term monitoring program on the St. Lawrence River from 1990-2008, with temporary suspension in the mid-late 1990s. Our program has concentrated on the upper river, from Lake Ontario to Quebec, but has included areas of the lower river in some years, and upstream as far as Lake Erie in others. The primary monitoring protocol has involved examining navigational buoys (navaids) retrieved annually from Canadian and U.S.A. waters and stored on land during the winter break between navigational seasons. The annual winter buoy survey has been supplemented sporadically by SCUBA-based surveys, riparian surveys, bottom dredge sampling, and other techniques. Systematic examination of navigational buoys holds the greatest promise for consistent long-range monitoring, but some shortcomings must be ameliorated. Initial navaid-based monitoring was qualitative, but we later incorporated semiquantitative ranking, and are now developing quantitative methods for measuring densities of keystone species such as hydropsychid caddisflies that dominate the benthos in many areas. Other shortcomings are that annually retrieved navaids preferentially sample shallow-water environments and species that are rapid colonizers. This could be improved by using the winter navaid examination for large-scale sampling, but including spot sampling of deployed navaids by SCUBA or other means throughout the navigation season. The power of navaid examination, whether on shore in winter or in the water during other seasons, derives from having consistent exact locations for long-term sampling. We recommend combining monitoring on the upper and lower St. Lawrence River, with renewed emphasis on improving quantification and standardization of protocols.

Conn, Dr. D. Bruce
Department of Biology
Berry College
Mount Berry, GA 30149-5036
U.S.A.
Tel: (706) 236-1756
Fax: (706) 238-7855
E-mail: bconn@berry.edu

SOURCE WATER PROTECTION AND PUBLIC PARTICIPATION: A CRITICAL COMPARISON OF THEORY AND PRACTICE

Natasha Crane and Roger D. Needham

What must public participation architecture contain in order to reflect environmental justice in watershed planning and management? The answer is linked to the evolving Source Water Protection Initiative in Eastern Ontario. This initiative has a legislatively prescribed public participation process facilitated by the regions two Conservation Authorities, managed by a professional coordinator, advised by a locally derived "Source Protection Committee" of community stakeholders (Clean Water Act, 2006, S.O. 2006, c22), and supported by upper and lower tier municipalities. Although the Source Protection Committee Model has a blueprint, one is left questioning whether or not its process is sensitive to the insightful thinking associated with contemporary assessments of public participation experience in watershed management in Canada and elsewhere. In this context, the literature has been comprehensively reviewed, and a generic model of public participation has been constructed. Its interrelated components capture the essence of public participation architecture emanating in a variety of public policy domains. Each of these components form the foundation for questions directed towards four stakeholder types, including Ontario's Source Water Protection Architects, its implementers, and its beneficiaries. Research ambitions aim to assemble these stakeholder perceptions and test them against the Generic Public Participation Model. Preliminary results indicated predictable, surprising and alarming results. Strengths and weakness from both the Generic Model and the Source Protection Committee Model are identified, and recommendations are coined in an effort to improve process architecture creating public participation that is more satisfactory for both the public and the decision-maker.

Crane, Natasha
Department of Geography and Environmental Studies
University of Ottawa
Ottawa, Ontario K1N 6N5
natashacrane@hotmail.com and rdnad@uottawa.ca

DECLINING CATCHES OF AMERICAN EEL (ANGUILLA ROSTRATA) IN THE LOWER ST. LAWRENCE

Yves de Lafontaine

Changes in abundance, seasonal occurrence, and mean size of American eels *Anguilla rostrata* in the lower St. Lawrence River during the past 50 years were examined. Catch per unit effort indices were calculated from daily catch records of eels captured in an experimental trap fishery and from the personal logbooks of knowledgeable fishermen. These two indices indicated a significant declining trend in eel catch rate by more than 70% since the early 1970s. Interannual fluctuations in catch rate were not related to variability in water level or water temperature. The timing of eel occurrence varied significantly between years and was inversely correlated to water level in August and September. It is hypothesized that eel movement is strongly determined by climatic/hydrological conditions in the previous summer. The average weight of eels has increased by 30% over the past eight years. The decline in catch rate and the increase in mean size of migratory silver eels in recent years are interpreted as the most significant symptoms of low recruitment levels and the precursory signal that the eel fishery in the lower St. Lawrence River may not be sustainable in the very near future.

de Lafontaine, Yves
Centre Saint-Laurent
Environnement Canada
105 McGill Street
Montréal, QC
H2Y 2E7

EVALUATING A SINGLE CAMERA SYSTEM FOR QUANTIFYING EBULLITION FROM GASSY FRESHWATER SEDIMENTS

William de Wit

A single camera system for measuring ebullition from freshwater gassy sediments is presented. The employment of relatively inexpensive video equipment along with laboratory-based analysis techniques were evaluated for use in quantifying ebullition from freshwater gassy sediments in the St. Lawrence River near Cornwall, ON. The calculated rate of appearance of gas from the theoretical data is 724ml/m²/day which appropriately represent the rate of appearance historically observed in the region. It is recommended that any further experiments of this type be conducted at differing times of day, weather conditions and water depths to assess any lighting differences that may affect image processing techniques.

de Wit, Willy
Biological Engineering
University of Guelph
Tel: (519) 341 5100
E-mail: wdewit@uoguelph.ca

FUNCTIONAL TRAITS AND TAXONOMY OF BENTHIC MACROINVERTEBRATES AS ALTERNATIVE TOOLS FOR ECOLOGICAL RISK ASSESSMENT (ERA): THE CASE OF THE ST. LAWRENCE RIVER

Mélanie Desrosiers^{1,2}, Ginette Méthot¹, Stéphane Masson³, Louis Martel², Marc P. Babut⁴, and Bernadette Pinel-Alloul¹

¹ Université de Montréal, GRIL, Dépt de Sciences biologiques, Montréal, Québec, Canada; ² CEAEQ, Ministère du Développement durable, de l'Environnement et des Parcs du Québec, Québec, Québec, Canada; ³ Parc Aquarium du Québec-SEPAQ, Québec, Québec, Canada; ⁴ Cemagref-Laboratoire d'Écotoxicologie, Lyon, France

This study is a part of a large research project aiming at developing an ERA tiered framework for sediment management, in the context of integrated management of contaminated sediment and sustainable navigation. The purpose of this study is to assess sediment quality by exploring the relationships between chemical contamination and benthic community structure using classical taxonomy and functional traits approaches. During falls 2004-2005, macroinvertebrates were collected in 59 sites in the St. Lawrence River, especially in its three fluvial lakes and in the harbour zone of Montreal. Organic (PCBs, PAHs, petroleum hydrocarbons), inorganic (As, Cd, Cu, Cr, Hg, Ni, Pb, Zn) contaminants and sediments characteristics (e.g. grain size, metal-binding phases, nutrients) were measured in the whole sediment. Taxonomy and functional traits of benthic macroinvertebrates in the St. Lawrence River will be used to assess the relative impact of chemical contamination and sediment characteristics applying multivariate analysis and variance partitioning. We will compare the potential of taxonomy and functional traits approaches for assessing sediment contamination and toxicity. We also established sediment classification with different methods such as benthic community (taxonomy or traits), bioassay and quotient of chemical concentrations relative to St. Lawrence River sediment quality guidelines. The preliminary results and the implication for the development of an ERA tiered framework will be discussed. This work is supported by Environment Canada and the Ministère du Développement Durable, de l'Environnement et des Parcs du Québec.

Desrosiers, Mélanie
GRIL, Département de Sciences biologiques
Université de Montréal
C.P. 6128, Succ. Centre ville
Montréal, Qué., H3C 3J7
Tel: (514) 207-3596
Fax: (514) 343-6216
E-mail: melanie.desrosiers.3@umontreal.ca

FISH ENHANCEMENT, MITIGATION AND RESEARCH FUND

DeWeese, June, U.S. Fish and Wildlife Service; Peter Gibbs, Ducks Unlimited; Dr. John Farrell, Thousand Islands Biological Station, and Ken Oliveira, University of Massachusetts.

The U.S. Fish and Wildlife Service manages a \$24 million Fish Enhancement, Mitigation and Research Fund (FEMRF), provided by the 2003 FERC Settlement Agreement with the New York Power Authority for the relicensing of the Moses-Saunders hydropower dam across the St. Lawrence River. The Agreement created a fund manager who would establish and chair a multi-national Fisheries Advisory Committee (FAC) to offer advice relative to what types of projects would benefit aquatic resources in the Lake Ontario/St. Lawrence River Basin and be appropriate for funding. The fund manager proceeded to implement the Agreement by mining prior planning efforts to identify widely supported goals and objectives and yield numerous contacts with like-minded collaborators. The FAC developed a research and conservation strategy, in collaboration with species experts, focusing on five native fish species representative of the aquatic ecosystem impacted by the power project. Incoming proposals are evaluated relative to the goals of the conservation strategy and also need to include a monitoring component in order to evaluate the population response. Outreach and communication beyond the original collaborators has developed contacts with willing landowners and matching funding opportunities. In 2006 and 2007, approximately \$1 million in conservation actions were funded each year.

DeWeese, June

Case Study 1. The Delaney Bay project was funded to Ducks Unlimited in 2006. The water management regime for the St. Lawrence Seaway creates aquatic habitat conditions that encourage cattails to out compete native sedges. The increased density in vegetation ultimately blocks fish passage into the spawning habitats of the shallow marshes of the St. Lawrence River. Using both FEMRF funds and a grant from the North American Wetlands Conservation Program, a project was implemented at Delaney Bay, Grindstone Island, that combined water level controls with a fish ladder in the aquatic habitat and grassland restoration in the adjacent uplands. Additional partners in the project included the Service, the Thousand Islands Land Trust, and the Thousand Islands Biological Station.

Schwartz, Carl, Gibbs, Peter, and Farrell, Dr. John

Case Study 2. A research study to establish presence or absence of the recently introduced swimbladder parasite in the St. Lawrence River population of the American eel was funded to the University of Massachusetts in 2006. American eels in the St. Lawrence River system have the longest reproductive migrations of the entire species and therefore are most likely to suffer the greatest impact of the parasite infection. This 2-year study included collection, parasite examination, and age analysis of eels throughout the St. Lawrence River and the Maritimes.

Oliveira, Dr. Ken

CASCADING INFLUENCES OF WATER LEVEL REGULATION ON COASTAL WETLAND HABITAT AND FAUNAL LINKAGES IN THE UPPER ST. LAWRENCE RIVER

John M. Farrell, Don Leopold, Jerry Mead, Brent Murry, Alison Halpern, Jason Toner, and Molly Rippe

The natural flow regime paradigm implies that river ecosystem integrity depends on the unimpeded dynamic nature of flow and provides a basis for river conservation and restoration activities. We will examine elements of ecosystem integrity in the upper St. Lawrence River Thousand Islands Archipelago with a focus on coastal wetlands and fish populations that depend on them as habitat. A synthesis of recent research efforts that revolve around the interruption of the natural flow regime will examine linkages water levels management and important ecological functions.

Farrell, John M.
SUNY College of Environmental Science and Forestry
Department of Environmental and Forest Biology
253 Illick Hall
Syracuse, NY 13210
Tel: (315) 470-6990
E-mail: jmfarrell@esf.edu

ECOLOGICAL CHANGES IN THE THOUSAND ISLANDS ARCHIPELAGO

John M. Farrell, Vijay Patil, Kristen Holeck, and E.L. Mills

We will examine trends in nutrient and other water chemistry parameters in relation to changes in biota including benthos, zooplankton, and fish. By contrasting the paradigm of enrichment of the mid-1970s to the present day status of nutrient poor/invasive rich, we will examine responses revealed in monitoring datasets among trophic levels. Nearshore and offshore processes will be highlighted in an attempt to better understand the influence of changes and linkage among abiotic and biotic systems along an 80 km longitudinal gradient. Information presented will be used to make inferences of how ecological change may influence freshwater communities and ultimately fish production.

Farrell, John M.
SUNY College of Environmental Science and Forestry
Department of Environmental and Forest Biology
253 Illick Hall
Syracuse, NY 13210
Tel: (315) 470-6990
E-mail: jmfarrell@esf.edu

ESTIMATING THE MOVEMENT OF TOTAL (THG) AND METHYL MERCURY (MEHG) FROM CONTAMINATED SEDIMENTS TO OVERLYING WATER IN THE ST. LAWRENCE RIVER NEAR CORNWALL, ONTARIO

Mahsa Fathi, Jules. M.Blais, Jeff .J Ridal, David .R.S. Lean

MeHg is considered to be the most toxic form of mercury and the only form to biomagnify in the aquatic food web. The St. Lawrence River near Cornwall, Ontario was designated an Area of Concern by the International Joint Commission (IJC) in 1985 because of contamination with mercury and other metals. This study investigated the potential for movement of mercury from the contaminated sediments to overlying water and compared these flux values with THg accumulation rates determined from radiometrically dated sediment cores. We measured concentrations of THg and MeHg in both the porewater as well as the solid phase of the sediments. These values were compared with concentrations in overlying water so that flux rates could be calculated. Concentration gradients were then used to indicate if sediments were acting as a source or sink for Hg. Complimentary redox-sensitive variables, including sulphate, sulphide and Fe^{2+} distributions are also provided. Although sediments were a net sink for THg, the flux of MeHg to the overlying water was positive but very low, and there was little seasonal variation in MeHg flux rates during the summer of 2007.

Fathi, Mahsa
M.Sc candidate
University of Ottawa
30 Marie Curie
Ottawa, K1N 6N5
PO BOX 450, station A
Tel: (613) 562-5800 Ext 2573
E-mail: mfath042@uottawa.ca

THE ROLE OF MICROBIAL COMMUNITIES IN HYPORHEIC SEDIMENTS OF TRIBUTARY STREAMS OF THE GREAT LAKES

Catherine M. Febria & D. Dudley Williams

In tributary streams, microbial communities are critical in responding to subtle environmental changes when higher species might not. We are investigating the interaction between dissolved organic carbon (DOC) – a key energy source for aquatic food webs – and the microbial community found in the hyporheic zones of two tributary streams of Lake Ontario. Hyporheic zones are the ecotone between groundwater and surface waters and are influenced by watershed processes. Here we present comparisons of microbial community composition in the surface and streambed water & sediments from unimpacted streams representing a gradient of natural environmental disturbance (i.e. permanent to intermittent streams). Microbial abundance and metabolism were similar between streams, depths and among season. While abundances and metabolism are comparable, molecular fingerprinting of the hyporheic sediment reveal shifts in the community that possibly reflect seasonal changes in the surrounding watershed. Together with abiotic parameters measured, we are beginning to understand the nature of biogeochemical interactions occurring at the base of stream food webs. It is well-understood that downstream communities (i.e. rivers, Lake Ontario) benefit from the processes occurring upstream. It is therefore critical to understand smaller tributaries and potential implications for food web processes within the Great Lakes Ecosystem.

Febria, Catherine M.
Surface and Groundwater Ecology Research Group
Dept. Biological Sciences (SW-544)
University of Toronto Scarborough
1265 Military Trail,
Toronto ON M1C 1A4
Tel: (416) 287-7420
Fax: (416) 287-7676
E-mail: catherine.febria@utoronto.ca

CHANGES IN THE MACROBENTHIC COMMUNITY STRUCTURE FOLLOWING THE INTRODUCTION OF THE INVASIVE ALGAE *DIDYMOSPHENIA GEMINATA* IN THE MATAPEDIA RIVER (QUÉBEC, CANADA)

Carole-Anne Gillis

In July 2006, blooms of *Didymosphenia geminata* Schmidt (didymo) were, for the first time, officially observed and identified in the Matapedia River, an Atlantic salmon fishing river in Eastern Quebec. This invasive algae can form thick and extensive benthic layers in stable flow and oligotrophic rivers. Between 2006 and 2007, rapid colonization and inter-catchment transfer processes were observed, notably in the Baie-des-Chaleurs watersheds as well as northern New-Brunswick rivers. The blooms in 2007 were apparently less important than in 2006 probably due to high water levels during this period. This study aimed at evaluating the effects of didymo on the macrobenthic community structure through the Matapedia Watershed. Macrobenthic samples were taken in 2006, upstream of the blooms and, at the same sampling site a year later, when it was affected by didymo. Preliminary results for 2006 describe %EPT between 60 and 85% for the three sampling sites without didymo. In 2007, surface cover by didymo does not exceed 30% in the Matapedia river whereas low densities and cover of this algae might increase number but diminish diversity of macrobenthic taxa and %EPT, although this is not yet confirmed. The results currently under analysis will be presented and field observations will be discussed in detail.

Gillis, Carole-Anne
Université du Québec
Matapedia River Watershed Council
165 St-Luc Street
Causapsca (Québec) G0J 1J0,
E-mail: gilliscaroleann@hotmail.com

WHY ARE FISH FROM THE ST. LAWRENCE RIVER AT CORNWALL, ON CONTAMINATED WITH MERCURY?

Hodson, P.V., Fowlie, A.R., L.E. Yanch, and M.B.C. Hickey¹

Queen's University, Kingston Ontario, Canada

¹St Lawrence River Institute of Environmental Sciences, Cornwall, Ontario, Canada

The St. Lawrence River at Cornwall, ON is identified as an "Area of Concern" by the International Joint Commission because sediments in depositional zones along the waterfront are contaminated with mercury in excess of Sediment Quality Guidelines. Surprisingly, yellow perch, rock bass, and brown bullhead from the most upstream zone contain higher concentrations of mercury than those from a zone that is only 2 km downstream where sediment mercury concentrations are highest. Possible reasons could include differences among sites in food web complexity (more trophic transfers and biomagnification), differences in fish growth rates and population structure, or a local or internal source of mercury at the upstream site, including pockets of wood fibre that release methane. Studies of stomach contents and analyses of stable isotopes indicate that the prey of perch are also most contaminated at the upstream zone, reinforcing the idea that there is an internal source of mercury at this site. There was also little increase in mercury concentration with trophic level, in contrast to a clear trophic gradient at the downstream site. This suggests that exposure of biota to excess mercury at the upstream site may be via the water column, and not via the diet and food web.

Hodson, Peter V.

Department of Biology and School of Environmental Studies,

Queen's University

Kingston, Ontario K7L 3N6

Tel: (613) 533-6129

Fax: (613) 533-6090

E-mail: peter.hodson@queensu.ca

ARE MERCURY ANALYSES OF AMPHIPODS BIASED BY UNAVAILABLE MERCURY IN THE GUT?

Jonathan Martin, Linda M. Campbell, Peter V. Hodson

Mercury (Hg) contamination of the St. Lawrence River along the Cornwall waterfront is the result of over a century of industrial inputs. Yellow perch (*Perca flavescens*) are contaminated above the consumption guidelines deemed safe by Health Canada in one of three contaminated depositional zones. A recent study of the diet of yellow perch showed that amphipods were the primary food source of yellow perch in these zones and that amphipods showed similar patterns of Hg contamination. To determine if Hg analyses of amphipods are biased by Hg present in their gut contents, a depuration study was performed to measure their rate of Hg loss from gut and tissues. Amphipods were collected in the field using artificial substrates (rock baskets). A sample was frozen immediately upon retrieval, and the remaining amphipods were kept in a sieve in a basin of filtered river water. A time series of sub-samples were collected to compare Hg concentrations in gut contents and tissues of amphipods before and after depuration. Over a depuration time of 32 hours, amphipods lost 30% total Hg, indicative of clearance of unavailable Hg in the gut. The data were used to estimate the portion of Hg bioavailable to yellow perch in a fish bioenergetics model. This will enable us to more accurately estimate the extent of Hg contamination that is moving through the Cornwall food web, leading to elevated concentrations in top trophic fish species.

Martin, Jonathan

Undergraduate Honours student

Department of Biology, Queen's University

Kingston, ON, K7L 3N6

Email: 4jm15@queensu.ca

DESIGN AND DEVELOPMENT OF KINECTRICS' EVER-CLEAR™ FILTER FOR BALLAST WATER TREATMENT

David Marttila, Luciano Gonzalez

To comply with International Maritime Organization (IMO) standards and regulations in the area of ballast water, ship owners need a reliable, safe, and economical tool capable of effectively managing both marine life and sediment in ballast water. There is a wide range of potential ballast water treatment technologies, and mechanical filtration is an integral part of most systems.

Kinectrics Inc., formally the Research and Development team of Ontario Hydro, developed a mechanical filtration technology in the early 1990's, the Ever-Clear™ Filter, capable of providing continuous filtration to 40 microns at high flow rates. Since the 1990's, the Ever-Clear™ filter has been successfully demonstrated to remove zebra mussels and other invasive species from process water sources in the electrical generation sector. To develop the Ever-Clear™ filter as a viable ballast water treatment technology, engineering modifications were required to improve its maintainability and suitability for shipboard use. Kinectrics has designed and developed a prototype Ever-Clear™ filter for ballast water treatment.

The construction of the prototype is expected to be completed February 2008. Kinectrics is actively pursuing both land based and ship board testing opportunities. Kinectrics is participating in the federally funded Sustainable Development Technology Canada™ *No Invasive Species On Board* project, and is scheduled to undergo land based testing at Maritime Innovation's facility in Rimouski, Quebec in April 2008. Other opportunities for shipboard testing in the United States are currently being discussed for fall 2008.

The design, development, and testing program of the Ever-Clear™ filter for ballast water treatment will be highlighted in this presentation.

Marttila, David
Scientist/Engineer, Kinectrics Inc.
800 Kipling Avenue
Toronto, ON, M8Z 6C4
Tel: (416) 207-6000 ext. 5891
Fax: (416) 236-0979
Email: david.marttila@kinectrics.com

HEMIMYSIS ANOMALA: DISTRIBUTION, ECOLOGY AND POTENTIAL FOOD WEB IMPACTS FROM THE LATEST INVADER OF THE GREAT LAKES

Marty, Jérôme¹(1), Koops, M. A. ⁽²⁾ and Gerlofsma, J. ⁽²⁾

- 1- University of Waterloo; Biology Department
- 2- Great Lakes Laboratory for Fisheries and Aquatic Sciences, Fisheries and Oceans Canada

In the mid-20th century, *Hemimysis anomala*, with a number of other Ponto-Caspian mysids, were deliberately introduced to lakes and reservoirs in Eastern Europe with the intention of increasing fish production. A few decades later, *H. anomala* has extended its distribution to Western Europe through unintentional introductions. In 2006, it was first reported in the Great Lake basin (Lake Michigan and Lake Ontario) and sampling in 2007 has confirmed its presence at many sites in these lakes as well as in Lake Erie. At this point, no ecological effects of *H. anomala* have been observed in the Great Lakes but several potential alterations are predicted based on impacts observed at invaded sites in Europe.

The goal of this presentation is to summarize available current information on this invader. Specifically, we will present 1-the current distribution of *H. anomala* in the Great Lakes basin, 2-the reported effects of its introduction based on a literature survey and 3-identify potential alterations to the Great Lakes food web.

Marty, Jérôme
University of Waterloo
Biology Department
200 University West
Waterloo, ON N2L 3G1
E-mail: jmarty@uwaterloo.ca

SOURCES OF CARBON SUPPORTING LOTIC FOOD-WEBS UNDER ALTERED FLOW REGIME: DOES TERRESTRIAL SUBSIDY MATTER?

Marty, Jérôme¹, Smokorowski Karen² and Power, Michael¹

¹ Department of Biology, University of Waterloo

² Great Lakes Laboratory for Fisheries and Aquatic Sciences, Fisheries and Oceans Canada

Terrestrial organic matter is the most abundant carbon source in boreal aquatic ecosystems and may represent a subsidy for food-webs of ecosystems with low primary production. Under altered flow regimes, the contribution of terrestrial carbon to the food-web may further be increased by frequent flooding of shores and the introduction of terrestrial flora and fauna to the aquatic biome. In this study, carbon stable isotope ratios (^{13}C) of terrestrial and aquatic vegetation were used in two source mixing models to predict the proportion of allochthonous versus autochthonous carbon in key macroinvertebrate and fish taxa. Two oligotrophic rivers from the boreal ecoregion were considered: the unregulated Batchawana River and the regulated Magpie River. In addition, restricted (2003-2004) and unrestricted (2005-2006) ramping rate flow regimes (rate of change of flow) were applied in the Magpie River which allowed for the identification of variations in carbon sources along a gradient of flow perturbation.

^{13}C values were significantly lower in regulated sites compared to unregulated sites, revealing the importance of processes occurring in the upstream reservoir on the ^{13}C variability at sites situated below the dam. No significant differences in ^{13}C of consumers were found under restricted and unrestricted flow regimes, implying that flow perturbations did not significantly modify the carbon sources fuelling the food web. Using mixing models, autochthonous carbon was found to be the main source of carbon for the food web in both the regulated and unregulated rivers. Results from this study confirm the carbon source paradox by showing that, despite high availability, there is low utilization of terrestrial carbon in the aquatic food-webs of regulated rivers.

Marty, Jérôme
Department of Biology
University of Waterloo
200 University Avenue West
Waterloo, ON, N2L 3G1, Canada
E-mail: jmarty@scimail.uwaterloo.ca

USE OF DECISION ANALYSIS IN THE DEVELOPMENT OF AN ACTION PLAN FOR RESTORATION OF AMERICAN EEL IN THE UPPER ST. LAWRENCE RIVER AND LAKE ONTARIO.

Mathers, Alastair, Rob MacGregor (Ontario MNR), Guy Verreault (Quebec MRN) and Lorne Greig (ESSA Technologies Ltd.) and possibly others from DFO, Quebec MRN, Ontario Power Generation, Quebec Hydro...

Over that past 2 decades the abundance of American eel (*Anguilla rostrata*) in the upper St. Lawrence River and Lake Ontario (USLRLO) has shown a decline as indicated by commercial catch records, passage at the Saunders Power Dam eel ladder, and other surveys.

Due to their complex life history and longevity, American eel are exposed to multiple sources of mortality (both human and natural sources) at a broad range of spatial and temporal scales. These complexities, the large number of jurisdictions (~25) involved in eel management, the availability of only very basic biological information, and a lack of information regarding spawning habitat all provide a tremendous challenges for local management of American eel.

Approximately 40% of the eels leaving the Lake Ontario system on their spawning migration are killed during passage through turbines located at the two hydro electric generating stations located on the St. Lawrence River. During 2005 and 2006, a series of workshops was held using the PrOACT approach to develop short term actions and a longer term strategy that would address objectives of: conservation and recovery of the USLRLO eel population, electric power generation, feasibility of implementation, socioeconomics, legal responsibilities and learning. Alternatives considered included spilling water during eel downstream migration, installation of 'eel friendly' turbines, diversion of eels to a bypass during downstream migration, trapping eels during their downstream migration and transporting them around dams, stocking and fisheries reductions. The consequences implied by each of the alternatives across the set of objectives were quantified in a model. The relative performance of each of the alternatives and the resulting action plan will be described in this presentation.

Action plans to promote the recovery of American eel in the USLRLO have been developed by both Ontario Power Generation and Quebec Hydro. Key components of the Action Plans include stocking, fisheries reductions and research into techniques to 'trap and transport' of eel during downstream migration.

Mathers, Alastair
Ontario Ministry of Natural Resources
Glenora Fisheries Station
RR 4, Picton, ON, K0K 2T0
Tel: (613) 476-8733
Fax: (613) 476-7131
E-mail: alastair.mathers@ontario.ca

LANDSCAPE GENETICS: DEFINING GEOGRAPHIC LIMITS TO POPULATION STRUCTURE AND IDENTIFYING CRITICAL ENVIRONMENTAL VARIABLES FOR ECOSYSTEM MONITORING/MANAGEMENT PROGRAMS

McCairns, R.J. Scott, Émilie Leclerc, Louis Bernatchez

Ideas concerning environmental monitoring and management strategies have undergone several fundamental shifts in recent decades, with much recent attention given to concepts of ecosystem management and the definition of appropriate units for conservation. Most of these concepts hinge on the accurate definition of populations, as well as delimiting their critical geographic scales. Moreover, the implementation of these ideas would be improved greatly by integrating information on relevant environmental variability. The newly emerging discipline of landscape genetics, the integration of landscape ecology with populations genetics, which links interactions between spatial/landscape features and microevolutionary processes, may prove an indispensable tool for such strategies. We demonstrate two examples of how we have employed this new approach to our research initiatives within the lower St. Lawrence River. In one example, we infer the spatial limits of yellow perch (*Perca flavescens*) populations within the lower St. Lawrence River to suggest best management units. We also discuss our research programme regarding threespine stickleback (*Gasterosteus aculeatus*) populations in the St. Lawrence estuary. Though fundamental in nature, this research serves as an example of how environmental variation can be integrated with data regarding genetic differentiation, an approach that can easily be incorporated into ongoing monitoring programs employing sentinel species.

McCairns, Scott
PhD Candidate/Étudiant au doctorat
Pavillon C-E Marchand, Local 1133
Université Laval
Québec, QC
G1V 0A6
Tel: (418) 656-2131 ext. 8455
Fax: (418) 656-7176
E-mail: scott.mccairns@giroq.ulaval.ca

ADVANCED SILICONE COATING TECHNOLOGY TO COMBAT THE INTRODUCTION OF INVASIVE SPECIES FROM THE EXTERIOR, UNDERWATER SURFACES OF VESSELS

Dr. Joe Morris, Dr. Sam Gido

It is well known that non-native invasive species, such as zebra mussels, were introduced into the Great Lakes and St. Lawrence River systems in approximately 1988 from the contents of ballast tanks of vessels from around the world while traveling these waters. Less emphasized, but equally important, is the fact that these same species also attach to the below water, exterior hull surfaces and structures of the same vessels enabling invasion without the emptying of ballast tank contents. A solution is fouling release coatings that prevent the specie's attachment to the underwater surfaces of vessels, thereby further eliminating their introduction into the water systems. However, formulating such coatings and systems so as not to pose a risk to the environment or to human health is challenging. Until recently, the universal approach to this problem relied on anti-fouling coatings that contain biocides (poisons) applied to the surfaces in order to kill the marine growth. Unfortunately, all such coatings are toxic and recent legislation issued by International Marine Organization (IMO) has established that use of such coatings containing Tributyltin will be prohibited starting September 2008. In addition, other coatings containing Copper are under increased regulatory scrutiny. A viable solution for vessel underwater surfaces is an advanced silicone coating technology that is durable, resists mechanical damage and causes marine organisms to release from surfaces without the use of harmful biocides or heavy metals. The technology and associated attributes of this advanced silicone fouling release coating system will be highlighted in this presentation.

Morris, Dr. Joe
Fuji Hunt Smart Surfaces
Vice President Research & Development
3350 Patuxent River Road, Unit F
Davidsonville, MD 21035
Cell : (443) 995-1792
E-mail: jmorris@fujihuntusa.com

FERRATE (IRON VI) AND EVER-CLEAR™ FILTRATION TECHNOLOGIES COMBINE TO DEFEAT INVADERS

Paul H. Patrick¹, Craig S. Alig², Luke J. Daly², David Marttila¹ and Luciano A. Gonzalez¹

¹Kinectrics, Inc., Toronto, Ontario, ²Ferrate Treatment Technologies, LLC; Orlando, Florida.

The introduction of non-indigenous species into aquatic ecosystems continues to challenge industries that depend on water for their livelihood. These challenges include ballast water treatment for the shipping industry and power plant cooling water for the power industry. Two complementary technologies have been proven to combat invaders in both these areas: Ferrate, a supercharged iron molecule having a valence state of +6, has been demonstrated both in the laboratory and aboard ship to completely disinfect screened ballast water at a dose of 2 mg/L; and the self-cleaning Ever-Clear™ Filtration System, which will remove silt and sediments, organic materials, and all organisms greater than 40 microns in size from influent water. For ship ballast water treatment, the filtration system will remove the larger organisms as ballast water is pumped onboard. Before the ballast water enters the ballast tanks, a Ferrator® will deliver a quick-acting dose of Ferrate to kill the remaining organisms. Any left over Ferrate rapidly reduces to iron oxide (Iron III), a naturally occurring compound in the aquatic environment. This same approach, when applied to the intake of cooling water for power plant condensers not only precludes entry of larger organisms, but also disinfects the cooling water and eliminates biofouling of the condenser tubes. This non-corrosive iron oxide is a very stable compound that does not have any adverse long-term toxicological effects, so the water released back into the environment will not be hazardous to aquatic organisms, wildlife or humans.

Patrick, Paul H.
SENES Consulting
121 Granton Drive, Unit 12
Richmond Hill, Ontario L4B 3N4
E-mail: ppatrick@senes.ca

SEASONAL ABUNDANCE, DIET, AND ENERGY CONSUMPTION OF ROUND GOBIES (*APOLLONIA MELANOSTOMA*) IN LAKE ERIE TRIBUTARY STREAMS.

Pennuto, Christopher, Peter J. Krakowiak, Christopher E. Janik

The non-native round goby is a benthic invertivore which has become established in every Great Lake and several tributary streams and rivers. Multiple reports document its negative impact on benthic macroinvertebrates and fishes in the Lakes and recent studies show stream fish and invertebrate communities are equally at risk. Populations of round gobies in the lower reaches of two Lake Erie tributary streams exhibit out-migration in winter and a return in the spring. Population size distributions suggest streams experience a peak recruitment of young gobies in July and low-level recruitment through October. Stream-dwelling gobies consumed primarily chironomid larvae, and the lack of molluscs forced large fish to remain generalist invertivores whereas lake-dwelling fish of equal size exhibit a diet shift to molluscivory. In this study, gobies consumed nearly twice as large a proportion of the energy available in amphipod tissue compared to other invertebrates (~0.8%), and they derived most of their energy from amphipods, chironomids, and caddisflies. The streams studied appear to have enough secondary production to support dense goby populations, though to the possible exclusion of other small benthic invertivorous fish. The proliferation of stream-dwelling gobies, coupled with observations on recruitment and winter movement, suggests the lower reaches of tributary streams may act as source populations for lake-bound gobies. It may be possible to take advantage of this out-migration behavior as a control strategy to capture large number of gobies each winter.

Pennuto, Christopher
Biology Department & Great Lakes Center
Buffalo State College
1300 Elmwood Avenue
Buffalo, NY 14222
Tel: (716) 878-4105
E-mail: pennutcm@buffalostate.edu

DEVELOPMENT OF A MONITORING TOOL FOR FISH POPULATIONS OF THE ST. LAWRENCE ESTUARY USING THE BYCATCH FROM THE COMMERCIAL EEL FISHERY

Pierre Pettigrew, Serge Perron, René Richard and Andrée-Anne Vézina

Beginning in the mid '90s, a fish monitoring program, including standard sampling methods, has been developed for the freshwater segment of the St. Lawrence River by the Québec Ministère des Ressources naturelles et de la Faune (MRNF). Fostered by the numerous benefits gained with this tool, another one is currently being developed by the MRNF for the brackish and tidal waters. This new tool uses the bycatch from the commercial eel fishery to collect data on fish populations and communities. At two different sites in 2006 and 2007, in order to evaluate fish catchability, catch efficiency and gear selectivity, eel weirs were compared to the standard gillnets and seines used for the freshwater segment. In two sampling seasons, nearly 60 000 fish and crustaceans were caught of which more than 15 000 were sampled. Atlantic tomcod (*Microgadus tomcod*) and rainbow smelt (*Osmerus mordax*) represent respectively 79% and 15% of the total sample. Regarding fish catchability and catch efficiency, the eel weirs caught 25 species out of a total of 28 species and they caught 95% of the total sample. Also the eel weirs appear less selective, as for each species, samples cover a larger size range. This new monitoring tool will be reliable, easy to support, practical and cost effective. Samples, taken annually from the commercial eel fishery bycatch and adjusted for gear selectivity, will give valuable information about ecological integrity and the status of key species of the St. Lawrence Estuary.

Pettigrew, Pierre
fisheries biologist
Ministère des Ressources naturelles et de la Faune
186, rue Fraser
Rivière-du-Loup, Québec, G5R 1C8
Tel: (418) 862 8213 ext. 303
E-mail: pierre.pettigrew@mrnf.gouv.qc.ca

DOES GAS BUBBLING FROM SEDIMENTS INCREASE THE TRANSFER OF MERCURY TO AQUATIC FOOD WEBS?

Razavi, Roxanne, Linda M. Campbell, Jeff Ridal, Peter V. Hodson

The St. Lawrence River near Cornwall, ON, is designated as an Area of Concern (AOC) due to a legacy of industrial mercury (Hg) inputs for over a century. Understanding Hg bioavailability is complicated by a paradox between patterns of contamination in yellow perch (*Perca flavescens*) and their prey items and contamination in sediments. Specifically, one zone exhibits higher than expected Hg uptake by biota. Methane gas produced as a result of decomposing fibre deposits are suspected of disturbing the natural burial processes which would reduce exposure of biota to old Hg deposits. Artificial substrates were used *in situ* to collect amphipods (*Gammaridae*) and gas measurements were taken over the deployment period. Corresponding sediment and porewater samples were preserved to assess uptake routes. Preliminary results from June and August 2007 indicate possible site avoidance by amphipods at high bubbling locations, and do not point to a relationship between bubbling rate and [THg] in amphipods. Increasing porewater [THg] concentrations correspond to high bubbling sites but still do not explain amphipod contamination. While bubbling may not affect mercury concentrations in amphipods directly, it is possible that bubbling forces amphipods into areas where they accumulate more Hg.

Razavi, Roxanne
Department of Biology
Queen's University
Kingston, ON
E-mail: 5rr19@queensu.ca

MONITORING ST. LAWRENCE ECOSYSTEM'S HEALTH USING FISH COMMUNITIES: FROM 1995 TO 2006

Yorick Reyjol, Pierre Dumont¹, Yves Mailhot¹, Philippe Brodeur¹ and Marc Mingelbier¹

¹ Ministère des Ressources naturelles et de la Faune du Québec

In 1995, a large scale standardized monitoring program was started in the Québec freshwater part of the St. Lawrence River. Up to 600 stations were sampled using beach seines (every km along the shore) and multimesh gillnets (every 1.5 square km) during the period 1995-1997, covering five fluvial reaches between Lake Saint-François and Québec City. Those valuable data were largely used for assessing the state of the St. Lawrence River ecosystem, including population dynamics, contaminants, invasive species, rare and threatened species, relation with habitat characteristics, discharge regulation influence, etc. An index of biotic integrity, adapted from the original IBI by J. Karr, was developed for this large scale river. The IBI, generally ranging between fair and poor values, indicated a deteriorated state of the river. This trend was associated with several anthropogenic factors, among which habitat fragmentation and alteration, shipping traffic, water level regulation, dredging, past toxic loading, were likely the most stressful. The same sampling procedure was repeated during the period 2001-2006. The present work compares the St. Lawrence state between these two periods (1995-1997 and 2001-2006) in terms of fish diversity, community structure and IBI scores. We also highlight some potential effects of new types of pressures and propose some improvements to the initial IBI.

Reyjol, Yorick,
Université du Québec à Trois-Rivières
Département de Chimie-Biologie
Université du Québec à Trois-Rivières
C.P. 500
Trois-Rivières, Québec, G9A 5H7
Tel: (819) 376-5011 ext. 3379
E-mail: yorick.reyjol@uqtr.ca

NEW FINDINGS RELATED TO RIVERBANK EROSION ALONG THE ST. LAWRENCE: THE RELATIONSHIP BETWEEN DEFLOCCULATION OF CLAY AND WATER LEVELS

Richard, Louis-Filip, Serge Lepage¹

¹ Manager of the Biosphere, Environment Museum Environment Canada

Riverbank erosion is not a new phenomenon along the St. Lawrence. A number of geological, chemical, climatological and biological processes were studied in an effort to gain insight into the mechanisms influencing erosion. These mechanisms include deflocculation of marine clays, freeze–thaw cycles, run-off, agricultural activities and riverbank deforestation. Studies have shown that wave action from passing commercial ships is partly responsible for the bank erosion and that the distance between the shipping channel and the shore is another factor that comes into play. Detailed analyses have shown that intermediate water levels cause more erosion than low levels (the waves do not reach the shore) or very high levels (the waves break on islands). The results of shoreline retreat measurements, which are made several times a year, indicate that water levels have an impact equivalent to ship-generated waves in terms of causing shoreline erosion. Following the analysis of combined data sets, such as water levels and suspended solids (SS) concentrations at Bécancour, a new interpretation has emerged. It appears that after a period of low water levels, marine clays deflocculate as soon as the water level starts to rise. Researchers have found a proportional relationship between the SS concentration and the water level which is linked to clay deflocculation.

Richard, Louis-Filip
Specialist, Water and Sediments
St. Lawrence Centre Environment Canada
105 McGill Street
Montreal, Quebec H2Y 2E7
Tel: (514) 496-6236
Fax: (514) 496-2676
E-mail: louis-filip.richard@ec.gc.ca

RECENT RESEARCH ON MERCURY IN ST. LAWRENCE RIVER SEDIMENTS AND IMPLICATIONS FOR THE CORNWALL SEDIMENT MANAGEMENT STRATEGY

Jeff Ridal

A series of bottom sediment deposits located in embayments of the St. Lawrence River near Cornwall, Ontario have been the focus of a great deal of scrutiny over the past 20 years as part of the Remedial Action Plan (RAP) process for cleaning up the most degraded areas in the Great Lakes and St. Lawrence River. After a five-year consultative process involving stakeholders, a Cornwall Sediment Management Strategy, was finalized in 2005 to address mercury contamination of these sediments. The Cornwall Sediment Management Strategy involves leaving sediment in place based on information that showed the sediment deposits are stable and being covered with a cleaner layer of material and therefore do not pose a significant ecological risk through direct toxicity and food chain biomagnification. For these reasons, natural recovery of the sediment with administrative controls was considered the best option. This strategy requires on-going monitoring of mercury concentrations in sediments and fish, and coordination and interactions among the many agencies to control activities along the Cornwall waterfront to ensure that sediments are not disturbed. In a statement on this approach, the St. Lawrence River Restoration Council (SLRRC), the local implementation committee, stated "... the ...Strategy needs to be flexible enough to accommodate changes as the scientific knowledge improves and as effectiveness of administrative controls is reviewed by agencies." and in particular, "Additional work needs to be done in Zone 1 to investigate the elevated levels of mercury [in some fish] and to determine the source(s)" (Whittaker, 2004). Since 2004, two major research projects involving a collaboration of university, non-governmental and agency researchers have been conducted on these sediment deposits to better describe the biogeochemical fluxes of mercury and the pathways for bioaccumulation into fish. Additional agency-led monitoring on stormwater inflows and other possible fugitives sources of mercury (e.g. from nearby industrial lands and old canal that discharges into the river) has also been carried out. Specific focus has been applied to collecting data in zone 1 where concentrations of mercury in some fish were initially found to be elevated. These studies have further described the complexity of this zone, with large areas containing bark and wood chip deposits undergoing continued decay, and remaining high concentrations of mercury in the top sediments. There is now more compelling evidence for enhanced exposure of mercury to biota within this zone as benthic invertebrates and yellow perch, resident within the zone during summer months, contain higher concentrations of mercury than the same organisms from other waterfront and reference zones. While the sediments are a potential source of mercury, the exact mechanism(s) and pathways of mercury uptake to the biota remain unclear. This presentation will highlight these main findings in the context of the Cornwall Sediment Management Strategy and the goal of the SLRRC to delist this RAP in the near future.

Reference

Whittaker, C. Review of Cornwall Sediment Strategy by the St. Lawrence River Restoration Council. Memo submitted to the Ontario Ministry of the Environment, September 14, 2004.

Ridal, Jeff
St. Lawrence River Institute of Environmental Sciences
Cornwall, Ontario

RURAL ACTIVISM AND ENVIRONMENTAL MANAGEMENT IN EASTERN ONTARIO

Melanie J. Robin and Roger D. Needham

The rural revolution as coined by the Ontario Landowners' Association has demonstrated considerable momentum in the past eight years. Its activism has evolved both outside and inside of governmental decision making structures. The Association has moved from using primarily purposefully illegality, such as demonstrations, to active involvement in provincial politics. In this context, research is guided by the central research question, *What attributes of the OLA are perceived to be the most important to its influence on rural public policy?* The primary focus, therefore, is on those traits that have the potential to influence public policy content, its implementation, and its acceptance in rural Ontario. In addition, there is a strong interest in understanding those issues and problems which serve to incite activism and make the Association popular with rural landowners. Four stakeholder groups sensitive to environmental, water and other public policy directed at rural communities are consulted. They are provincial and municipal elected politicians (Architects of policy), Managers and Planners of provincial ministries (Implementers of policy), rural and agricultural commodity and interest groups (Recipients of policy), and the Ontario Landowners Association (Challengers of policy). Research results show shared perceptions among groups, specific perceptions of specific groups, and completely unanticipated perceptual responses. For example, the need for water and environmental care and management (Shared); the differing perceptions of property rights compensation and the intrusive nature of government (Specific Groups); and the high level of issue and problem understanding among all stakeholders (Unanticipated). In conclusion, recommendations will be directed at each of the groups. These recommendations are designed to break barriers to sustaining or reclaiming environmental justice and facilitate respect for different points of views and differing contributions to environmental management.

Robin, Melanie
Department of Geography and Environmental Studies
University of Ottawa
Ottawa, Ontario K1N 6N5
mrobi103@uottawa.ca and rdnad@uottawa.ca

WATER CONNECTIONS: CANADA'S NEW RESOURCE FOR WATER INFORMATION

Sneyd, Bob

Access to current and relevant information remains one of the biggest challenges to managing Canada's water resources. The broad landscape of actors (government, watershed, stewardship, Aboriginal and local community groups and agencies), and their overlapping mandates and jurisdictional responsibilities makes the sharing of water related information unnecessarily difficult and impractical. Yet the ability of groups to communicate, not only between one another, but also with policy makers and the public in general, is fundamental if any comprehensive solutions to our water quality challenges are to be anything more than polite suggestions.

With this in mind, **Centre for Sustainable Watersheds** has been spearheading the national *Water Connections* initiative in an effort to address the issue of water information availability. Scheduled for launch in June 2008 at CRWA's Annual Conference, the final outcome of this project will offer a comprehensive and highly functional Internet portal for the purpose of centralizing access to water information. The portal will consist of: 1) a national directory of water sector organizations 2) an online library of water management tools and resources, 3) archived news and events service, 4) a data locating service linking users to digital data libraries across the country.

Being a truly comprehensive communication tool, *Water Connections* will offer the water resource sector a unique medium of information exchange. Addressing issues of public engagement, communication, and information access, we would be pleased to speak of our experiences developing this tool and the challenges and solutions we discovered along the way.

Sneyd, Bob
Centre for Sustainable Watersheds
Tel : (613) 272-5136
E-mail: sneyd@watersheds.ca

HUMAN OCCUPATION CHANGES OF THE ST LAWRENCE ESTUARY SHORES AND CONSEQUENCES ON THE WILDLIFE HABITATS

Guy Trecia

When the navigation channel was constructed in the estuary around the 1950's, concrete vertical walls were erected on long portions of the shores to protect riverside properties exposed to the waves created by the larger ships passing through. More than fifty years later, many of these walls are breaching and crumbling down. Today, new protection structures are needed to replace the old walls. But the use of these riverside properties has changed: what was mostly summer residences is frequently being transformed in permanent residence by people retiring from work and free to move out of town. The demand for riverside properties is high even if few of the buyers have any knowledge of the risks associated with the installation so close to the estuarine shore. The climatic and hydrological changes observed during the last years on the St Lawrence show an acceleration of the erosion processes probably explained by the shorter period of ice cover and a longer exposition of the shores to the erosion forces. The Regional administration of the Department of Natural Resources and Wildlife for the Chaudière-Appalaches Region consequently receives many requests to authorize protection works that may affect fish and wildlife habitat. Beside the issues regarding public access to such a large water body, the matter of shore artificialisation and of fish and wildlife habitat conservation is permanently addressed when answering these demands. The presentation will cover the actual situation observed in the Chaudière-Appalaches region. The necessity to adopt a set of specific rules for the future development and to include biodiversity in the process must be considered and a particular status as National Heritage for the St Lawrence corridor is suggested.

Trecia, Guy
Direction régionale de l'aménagement de la faune pour
la Chaudière-Appalaches
8400, Sous-le-Vent
Charny, QC, G6X 3S9
Tel: (418) 832-7222 ext. 229
Fax: (418) 832-1827
E-mail: guy.trecia@mrrnf.gouv.qc.ca

SEASONAL AND SPATIAL GRADIENTS IN WATER QUALITY AT BRANDY BROOK, A ST. LAWRENCE RIVER TRIBUTARY, MADE USING ADVANCED FLUORIMETRIC INSTRUMENTATION

Michael R. Twiss and Matthew R. Williams

The limnology at the mouth of Brandy Brook in Waddington, NY and its transition into the main channel of the St. Lawrence River was investigated with an emphasis on the phytoplankton community and water quality. Real-time geo-referenced fluorometric data measuring phytoplankton composition (using a FluoroProbe, bbe Moldaenke GmbH), photosynthetic health (viz., photosynthetic efficiency using a Fast Repetition Rate Fluorimeter, Chelsea Technologies) and colored dissolved organic matter (10-AU, Turner Designs) were collected along transverse transects from the mouth of Brandy Brook (NY) to the north shore of the St. Lawrence at Morrisburg (ON). Fixed stations in Brandy Brook and the main channel of the St. Lawrence River were also sampled to characterize the light regime, size-fractionated chlorophyll-a content, and total phosphorus concentration. Six investigative surveys were conducted from autumn 2005 to summer 2007. Strong seasonal and spatial variations in community composition are evident. These techniques can be used for local comparative studies of impacted areas in the Cornwall/Massena Areas of Concern and on a larger scale in the Great Lakes.

Twiss, Michael R.
Associate Professor and Director
Great Rivers Center, Clarkson University
Potsdam, New York, 13699,
Tel: (315) 268-2359
Email: mtwiss@clarkson.edu

NUMERICAL MODELING OF THE EFFECTS OF WATER LEVEL CHANGES IN THE SAINT-LAWRENCE RIVER AND ITS TRIBUTARIES.

Verhaar, Patrick¹, Pascale Biron²

¹Département de géographie, Université de Montréal

²Department of Geography, Planning and Environment, Concordia University

Over the next 50 to 100 years, discharges within the lower Saint-Lawrence River, between Montreal and Quebec City, are anticipated to decrease, leading to lower water levels. As the water level of the mainstream is the base level for its tributaries, these changes are expected to affect the morphology and sedimentology of the tributaries of the Saint Lawrence River. This research investigates the morphological response of five tributaries of the Saint-Lawrence River (Batiscan, Richelieu, Saint-François, Saint-Maurice and Yamachiche rivers) to a decrease in base level combined with discharge changes in the tributaries due to climate-induced variations in precipitation and evaporation. The quantification of the morphological and sedimentological impact of these changes on the tributaries is done with the use of a one-dimensional numerical model (SEDROUT). Results indicate that the impacts of water level changes are more present in rivers that are stable or slightly aggrading under current conditions. Sediment delivery from the tributaries to the Saint-Lawrence River will increase as the tributaries undergo degradation. Increased sediment supply from tributaries draining into Lake Saint-Pierre (Yamachiche, Richelieu and St-François) is particularly important to quantify because of the key ecological role of this shallow lake. However, differences in the simulated sediment delivery rates using different climatic scenarios are considerable, which limits the precision of the predictions. For the Saint-Lawrence River and Lake Saint-Pierre, a two-dimensional model (H2D2) will also be used to identify areas that are sensitive to changes in sediment delivery and decrease in discharge.

Verhaar, Patrick
department of geography
Université de Montréal
C.P. 6128, Succursale Centre-Ville
Montréal, Qc, H3C 3J7, Canada
Tel: (514) 343 8037
Email: patrick.verhaar@umontreal.ca

MONITORING FOR ANADROMOUS RAINBOW SMELT (*OSMERUS MORDAX*) IN THE ST. LAWRENCE ESTUARY: A PERFORMANCE MEASURE FOR A VULNERABLE SPECIES

Guy Verreault, Rémi Tardif and Pierre Pettigrew

Anadromous rainbow smelt (*Osmerus mordax*), a key species in the St. Lawrence Estuary food web, experienced a steep decrease following spawning habitat degradation during the 80's and 90's. In an attempt to reverse the decline, a Recovery Plan targeting habitat restoration and fisheries restriction was set up. Since 1994, a continuing fisheries-independent time series has been maintained in one of the only four remaining spawning tributaries to assess restoration and management impacts. These surveys, carried out during the Spring spawning run, provide annual estimates of spawners abundance with annual catch per unit of effort (CPUE), sex-ratio, age and length structures for the last 14 years. Analyses showed that spawners abundance continued to decline with a simultaneous narrowing of length and age structures. As a result, overall stock fecundity decreased and the Recovery Plan measures did not fully succeed to reach restoration objectives. Further evaluation point up that sport-fishing, especially during winter time, has a strong impact on population structure by removing the most fecund individuals from the stock. Age at maturity for female is 2.9 years whereas spawners that have experienced the winter fishery and sampled the following Spring on spawning grounds exhibit a mean age of 2.4. This means that a significant proportion of rainbow smelt is harvested before having a single opportunity to spawn. New harvest limit was implemented and its impact will be evaluated with actual monitoring procedures in the coming years. Actual monitoring is very efficient for evaluating restoration and management measures targeting this vulnerable species.

Verreault, Guy
Fisheries Scientist
Ministère des Ressources naturelles et de la Faune
186, rue Fraser
Rivière-du-Loup, QC, G5R 1C8
Tel: (418) 862 8213 ext. 306
E-mail: guy.verreault@mrf.gouv.qc.ca

CHARACTERIZING WATER LEVEL FLUCTUATIONS OF ONTARIO'S BOREAL SHIELD LAKES

M.S. White, R.A. Metcalfe², M.A. Xenopoulos³

²Renewable Energy Section, Ministry of Natural Resources, Peterborough, Ontario.

³Department of Biology, Trent University, Peterborough, Ontario.

Very few studies have statistically characterized natural water level fluctuations (WLF) in lakes. Here we present long-term WLF data (~20yrs, sampled on weekly intervals during the ice-free season) for sixteen small (10-500ha) lakes in the Laurentian Great Lakes Region and short-term WLF data (1yr, sampled hourly all year) for sixteen large (>1000ha) lakes in Northern Ontario. The long-term data reveals that mean yearly amplitude in water level does not exceed 127cm ($\bar{x} = 26 \pm 15$ cm) and yearly average water levels do not deviate greater than 75 cm ($\bar{x} = 10 \pm 11$ cm) from the long-term mean. Linear and waveform regression analyses revealed a significant ($p \leq 0.05$) decreasing trend in water levels and a ten year oscillation in WLF. Analysis of the high resolution data showed that yearly amplitude ranged between 27 and 138 cm ($\bar{x} = 59 \pm 34$ cm). Amplitude was significantly ($P < 0.05$) correlated with dissolved oxygen ($r = 0.71$), basin/lake ratio ($r = 0.71$), recharge rate ($r = 0.81$), deep water ($r = 0.77$) and dense coniferous forest ($r = 0.52$). Using wavelet analysis we detected a consistent and coherent pattern among hydrographs and regional groupings. Record low water levels are now being recorded in several lakes across the globe and a better understanding of WLF is critical to assess loss of ecosystem services.

White, M.S.
Watershed Ecosystems Graduate Program
Trent University
Peterborough, Ontario

ANALYSIS OF DISSOLVED ORGANIC MATTER (DOM) USING FLUORESCENCE SPECTROSCOPY FOR WATER QUALITY AND HABITAT ASSESSMENT IN RIVER ECOSYSTEMS

Wong, Jessica, D. Dudley Williams

Fluorescence spectroscopy, a tool developed by analytical chemists, examines dissolved organic matter (DOM) in aquatic environments and approximates its various sources (e.g. microbial activity vs. terrestrial runoff). This technique has been applied successfully to fresh- and waste-waters to determine the presence of anthropogenic impacts (e.g. sewage effluents) on receiving water bodies. Compared with traditional wet chemistry, it is quick, inexpensive, and does not require large sample sizes. For a river ecosystem such as the St. Lawrence, fluorescence spectroscopy can work in parallel with existing water quality assessment programmes as a precursive indicator of biological integrity before more rigorous biomonitoring studies are conducted.

Wong, Jessica
MSc candidate
University of Toronto at Scarborough, Dept. of Biological Sciences
1265 Military Trail
Toronto ON M1C 1A4
Tel: (416) 287-7420
Fax: (416) 287-7676
E-mail: jez.wong@utoronto.ca

SUITABILITY OF FLOW REGIMES IN SUSTAINING UNIONIDS AND FISHES IN NORTH AMERICA

Xenopoulos, Marguerite A., Daniel E. Spooner, and Daelyn A. Woolnough

We tested for the relationship between various environmental flow indicators (e.g., maximum flow, minimum flow, mean discharge, number of days ephemeral streams are dry) and mussels and fish. We used modelled WaterGAP hydrological data and species-discharge curves to evaluate how changes in stream flow affect freshwater fish and mussels communities. We show that discharge is a strong predictor of both fish and mussel biodiversity. Using species-discharge relationships we show that mussels are more sensitive to reductions in flows than fish by a factor of two. Realizing that mussels use an array of fish hosts for their complex life-history, we modelled fish/mussel relationships concluding that the potential decline of mussels with reductions in flows is associated with mussel traits and not just confounding fish-host biogeography. Since mussels are relatively sessile, they lack the ability to seek refuge in the event of droughts.

Xenopoulos, M.A.
Department of Biology
Trent University
Peterborough, ON, K9J 7B8
E-mail: mxenopoulos@trentu.ca

WORKING WITH STAKEHOLDERS: MODELS FOR ENGAGEMENT

Charlotte Young, Ph.D.

Agencies and governments working on water resource management are often guided (albeit, often implicitly) by various philosophical underpinnings in their interactions with stakeholders. In this presentation we will review and compare four different philosophical approaches related to how decision makers and governments interact with stakeholders regarding management of water resources. Attendees at the session will have an opportunity to add to and build upon the models that are presented.

Young, Charlotte
Director of Practice/Environmental Facilitator/Evaluator
120 Dewhurst Blvd.
Toronto, Ontario M4J 3J6
Tel: (416) 778-4713
Fax: (416) 778-1956
Email: charlotte@envision-synergy.net