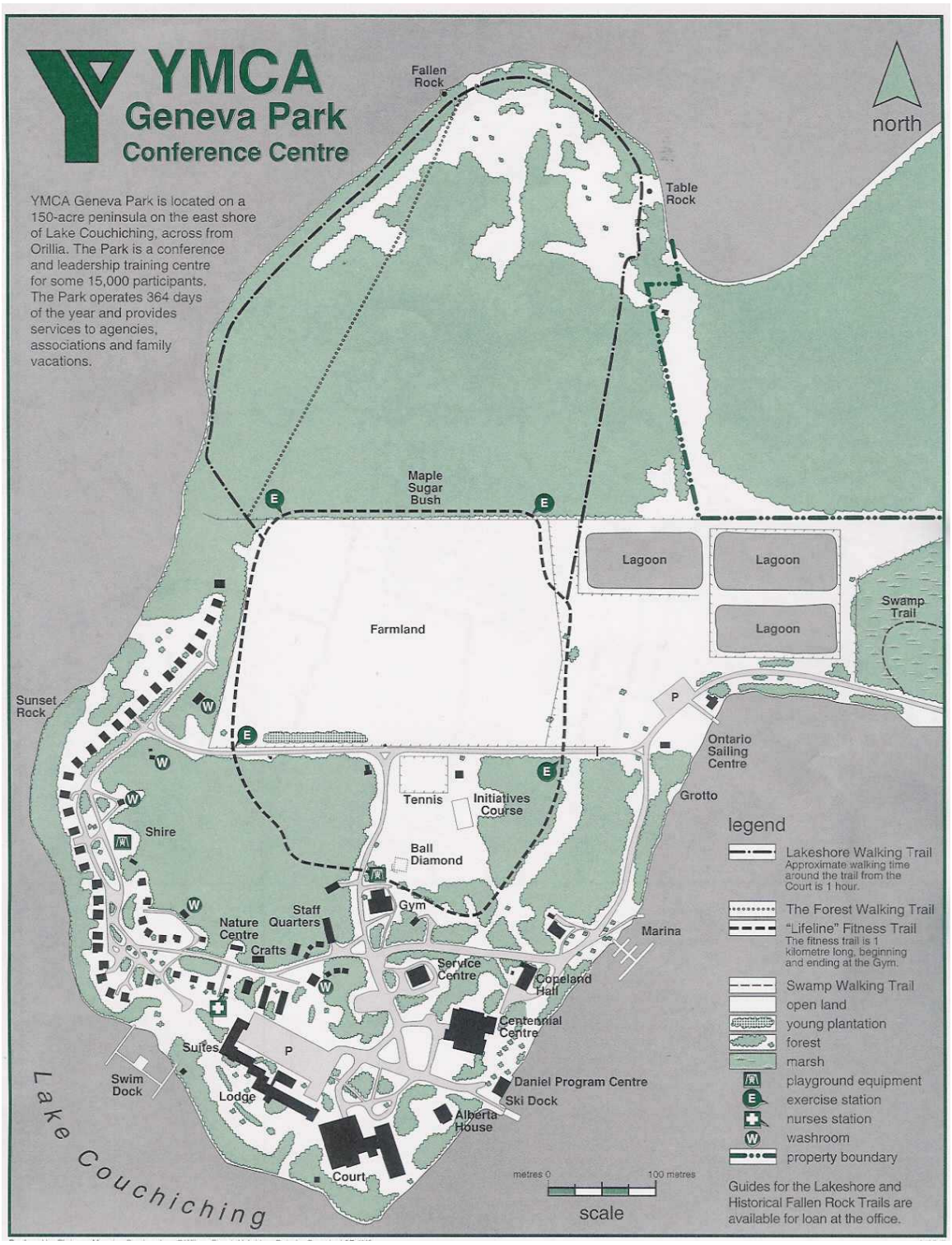
AMERICAN FISHERIES SOCIETY

ONTARIO CHAPTER

ANNUAL GENERAL MEETING

March 2nd -4th, 2006
Geneva Park, Orillia

"Bridging the Gap"



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Thursday March 2nd

Evening **Arrival, Registration & Opening Mixer (Geneva Lodge Lounge)**

Friday March 3rd

07:30 **BREAKFAST (Geneva Court)**

08:20 **Greeting and Conference Outline (Centennial Centre Room 15)**

08:30 ***Anishinabek/Ontario Fisheries Resource Centre programs.*** *Ed Desson (A/OFRC)*

09:00 ***The Bait Association of Ontario: issues and solutions.*** *Harold Harvey (BAO).*

09:30 ***Aquatic System Classification and its Application to the Great Lakes Conservation Blueprint for Biodiversity.*** *Mike McMurtry (OMNR)*

10:00 ***Eradicating the round goby from Pefferlaw Brook.*** *Beth Brownson. (OMNR)*

10:30 **Coffee & Poster Session (Room 15 Lounge)**

11:00 ***Watershed Rehabilitation: Bridging The Gap Between Doing And Knowing In The Great Lakes.*** *D.G. Fitzgerald (EcoMetrix Inc.)*

11:30 ***Prescription for Great lakes Ecosystem Protection and Restoration: avoiding the tipping point of irreversible changes.*** *Henry Regier (U of T-emeritus). Dedicated to the memory of Dr. Wes Curran, Queens University professor and mentor of H. Regier.*

12:30 **LUNCH (Geneva Court) & Poster Session (Room 15 Lounge)**

Student Session

13:30 ***Influence of Light Intensity On Activity And Habitat Utilization Of Walleye (Sander vitreus) In Two Northwestern Ontario Lakes.*** *B. Metcalfe, N. Lester, R. Mackereth, B. Jackson (Lakehead University)*

14:00 ***Agricultural Drains as Fish Habitat in Southwestern Ontario.*** *K.L. Stammler, Mandrak, N.E., McLaughlin, R. (University of Western Ontario)*

14:20 ***Managing naturalized salmonid populations: How can genetic tools help us?*** *P.A. Addison, C. C. Wilson, and. B. J. Shuter (University of Toronto)*

14:40 ***Will northern fish populations be in hot water because of climate change?*** *Sapna Sharma (University of Toronto)*

15:00 **Coffee & Poster Session (Room 15 Lounge)**

15:30 ***Development and use of the Wetland Fish Index to assess the quality of coastal wetlands in the Laurentian Great Lakes.*** *T. Seilheimer and P. Chow-Fraser (McMaster University)*

15:50 ***An evaluation of condition indices for the lake whitefish (Coregonus clupeaformis).*** *M.D. Rennie (University of Toronto)*

16:10 ***Temperature preference and tolerance differences between populations of lake trout.*** *J.L. McDermid, B.J. Shuter, and W.N. Sloan, (University of Toronto)*

16:30 ***Bigger is Better for Walleye (Sander vitreus) Recruitment: Modelling Maternal Effects in Harvested Populations.*** *P.A. Venturelli, B. J. Shuter, T. A. Johnston, N. P. Lester, and C. A., Murphy (University of Toronto)*

16:50 ***Evolution of active host-attraction strategies in the freshwater mussel tribe Lampsilini (Bivalvia: Unionidae).*** *David T. Zanatta and Robert W. Murphy (ROM)*

17:10-19:00 **Annual Business Meeting**

19:00- ??? **BBQ SUPPER and Social**

Saturday March 4th

07:30 **BREAKFAST (Geneva Court)**

08:30 ***Development of a Stream Sensitivity Assessment Tool.*** *Dan Gibson (Gartner Lee)*

09:00 ***Research on Fishes at the Canadian Museum of Nature.*** *Noel Alfonso (CMN)*

09:30 ***The art and science of catch-and-release: new perspectives on fish survival.*** *Steven J. Cooke (Carleton University)*

10:00 ***Changes to the federal boating regulations and what it means to fisheries professionals.*** *Capt. Brian Kennedy (Transport Canada)*

10:30 **COFFEE (Room 15 Lounge)**

11:00 ***Performance of Ontario's Benthos Biomonitoring Network: Impacts on Social Capital, Environmental Action, and Problem-Solving Capacity.*** *F. Chris Jones, et.al. (Ontario MOE)*

11:30 ***"Bringing Back the Salmon".*** *O. Haddrath and J. Smitka, (ROM and TUC)*

12:00 ***Conference Wrap***

12:30 **LUNCH (Geneva Court)**

Posters

A review of the physiological and behavioural consequences of cold shock on fish. *Michael R. Donaldson, Samantha Yu, and Steven J. Cooke (Carleton University)*

Do catch-and-release guidelines from state and provincial fisheries agencies conform to scientifically-based best practices. *Christine Pelletier, Kyle C. Hanson and Steven J. Cooke (Carleton University)*

Warner Lake Ecological Observatory: Insights into fish behaviour using a whole-lake three-dimensional acoustic telemetry array. *Kyle C. Hanson, Steven J. Cooke, Cory D. Suski, George Niezgoda, Frank J.S. Phelan, Caleb Hasler, and David P. Philipp (Carleton University)*

Re-Evaluation Of The Management And Conservation Of Lake Whitefish In Ontario Based On Genetic Diversity And Divergence. *A. Bernard, C.C. Wilson, D.L.G. Noakes, M.M. Ferguson, and B.J. Morrison (University of Guelph)*

Fish Stocking As A Tool For The Conservation And Restoration Of Native Lake Trout Genetic Diversity. *M.A. Halbisen and C.C. Wilson (Trent University)*

Movement of Brook Trout in the Cypress River, Lake Superior. *T.C. Pratt, M. Chase, and L.M. O'Connor (DFO)*

Oral Presentation Abstracts

Addison, P. A.[1], C. C. Wilson[2], and. B. J. Shuter[1].
[1] Zoology Department, University of Toronto, Toronto, Ontario; [2] Ministry of Natural Resources and Trent University, Peterborough, Ontario. (paddison@trentu.ca)

Managing naturalized salmonid populations: How can genetic tools help us?

Studies assessing the genetic structure of migratory Pacific salmonids within their native range have been vital to establishing effective management practices. However, for naturalized Great Lakes populations, genetic assessment has been limited and population structure remains generally undetermined. Naturalized populations of migratory steelhead (*Oncorhynchus mykiss*) in Lake Superior tributaries between Thunder Bay and Marathon, Ontario, were used as a model system to study genetic variation of an introduced salmonid in the absence of the potentially confounding effects of supplemental stocking. Multilocus genotypes for 30-50 individuals from each tributary were measured using 11 microsatellite loci. We found populations to have high allelic richness across most loci when compared to native steelhead populations, suggesting that naturalized populations have a diverse ancestry. Individual and population based analyses revealed significant large scale genetic structuring within the study area and limited genetic structuring at the local scale. Our findings suggest individuals from separate stocking events colonized different geographic areas, and that steelhead have maintained their strong ability to home to natal tributaries. These results have strong implications concerning colonization and differentiation of naturalized salmonids, and may provide insight towards developing appropriate management strategies.

Alfonso, N. Research Services Division, Canadian Museum of Nature, Ottawa, ON (nalfonso@mus-nature.ca)

Research on Fishes at the Canadian Museum of Nature

The context of our research is within the role of a natural history museum, encompassing the trio of Collections, Research and Education. Our fish collection contains sixty thousand lots of fluid-preserved specimens. We then research these natural history objects and relay the results via scientific papers, technical and popular books, as well as field guides and public talks. Research focuses mainly on taxonomy and systematics but also includes faunal studies and contributions that support conservation efforts.

Borwick, J.[1] and **B. Brownson**[2] (beth.brownson@mnr.gov.on.ca)
[1]Aurora District, OMNR; [2]Biodiversity Section, OMNR, Peterborough, ON.

Eradicating the round goby (*Neogobius melanostomus*) **from Pefferlaw Brook**.
Lake Simcoe is the largest inland lake in southern Ontario. Its vibrant recreational fishery is very important to the local and regional economies with an estimated value of $200 million dollars annually. Round goby (*Neogobius melanostomus*) were confirmed in Pefferlaw Brook, a tributary of Lake Simcoe in July 2004. No natural or man-made structures existed in the brook to prevent goby from spreading directly into Lake Simcoe. The Ontario Ministry of Natural Resources coordinated support from other provincial and federal agencies as well as non-government groups to undertake an aggressive surveillance program to determine goby distribution in Pefferlaw Brook, Lake Simcoe and other tributaries. While options to prevent the spread of round goby into Lake Simcoe were investigated, monitoring documented the continued downstream spread of goby toward Lake Simcoe. Consideration of feasible options, given the known distribution of goby in the system, lead to the decision to treat a 5 km section of the brook with a piscicide to attempt eradication of round goby before they became established in Lake Simcoe. The approach taken will be discussed including follow-up monitoring and assessment of project success.

Cooke, S.J. Ottawa-Carleton Institute of Biology, Carleton University, Ottawa, ON, (scooke@connect.carleton.ca)

The art and science of catch-and-release: new perspectives on fish survival

Catch-and-release angling is a popular recreational activity in Ontario and elsewhere around the globe. Not surprisingly, there has been a large amount of research activity focused on assessing the effectiveness of catch-and-release as a management and conservation strategy. Research efforts are moving beyond focusing on whether an individual fish lives or dies, and instead relying on more sensitive sublethal indicators (e.g., behaviour, physiology, fitness). We are learning that both angling gear and angling practices can influence the outcome of a catch-and-release angling event for an individual fish. Here, we briefly review some recent advances in catch-and-release science that have lead to the development of generalized guidelines that can extend across species, environments, and fishing strategies. These include: 1) minimize angling duration, 2) minimize angling during extreme water temperatures, 3) minimize air exposure, 4) use barbless hooks, circle hooks, and flies/ lures, and 5) limit angling during the reproductive period. We conclude by discussing strategies for making catch-and-release angling more consistent with the notion of maintaining the welfare status of angled fish.

Desson, E. A/ OFRC, North Bay, ON. (edesson@aofrc.org)

Anishinabek/Ontario Fisheries Resource Centre programs.

The Anishinabek/ Ontario Fisheries Resource Centre was established to provide information and advice to First Nations at a local level. The development of this Centre was a step toward "bridging the gap" between First Nations and government. Capacity building was not a mandated objective, but something that was needed and desired. No mechanism is presently in place to maintain capacity as it is developed, which would allow First Nations to take a more meaningful role in resource management decisions. The A/ OFRC undertook shortjaw cisco assessment projects with two First Nations in 2005, providing an example of how science can be used for practical use. Consulting with First Nations is becoming the standard order of business, for government and industry, but this has different meaning for all sides. Through meaningful discussion and agreements, benefits to aboriginal people can be increased, while the chances of a negative outcome are minimized. There is a need for both government and industry to commit to long term partnerships with the provision of support for these initiatives.

Fitzgerald, D.G. Ecometrix Inc, Brampton, ON (dfitzgerald@ecometrix.ca)

Watershed Rehabilitation: Bridging the Gap between Doing and Knowing In the Great Lakes.

Human activity has modified the rate of transport of nutrients like phosphorus (P) and sediments to streams and lakes of the Great Lakes basin. Excessive loading of P and sediments to surface waters can promote phytoplankton production and subsequently decrease water clarity, and this process is termed eutrophication. Such changes in surface waters typically act to reduce the dissolved oxygen levels, and this change alone can be sufficient to eliminate or severely reduce the abundance of species intolerant of low dissolved oxygen and favour species tolerant of these habitat conditions. The extensive impacts of eutrophication led to government initiatives like the Great Lakes Water Quality Agreement of 1972. These initiatives were framed by tenets that mandated activities thought to promote watershed rehabilitation through improvement of water chemistry. Such activities included the reduction of point and non-point sources of P and control of sediment loading through reforestation along riparian zones; ecosystem monitoring programs were also established at this time. The declines in P and improvements in water chemistry over the last two decades across the Great Lakes likely represent the engineered reversal of eutrophication, and this process has been termed oligotrophication. However, this planned habitat rehabilitation has been concomitant with the unplanned consequence of increasing the rate of successful invasions of tolerant nonnative species. Examples of invasions are numerous during this time and include invertebrates like the filter-feeding dreissenid mussels (*Dreissena* sp.) and vertebrates like the round goby (*Neogobius melanostomus*). Thus, an alternative

hypothesis to explain the process of oligotrophication may be the presence of abundant nonnative species and the benefits of government initiatives may actually be modest. For example, recent studies suggest that the largest improvements in water chemistry in the lakes of the Great Lakes basin may be due primarily to filter-feeding by dreissenid mussels. The existence of long-term ecosystem monitoring data allows for an analysis of the relationship between nonnative species and oligotrophication. This presentation will first review the evidence, impacts, and mechanisms of eutrophication and oligotrophication. The second component will evaluate the role of government programs and nonnative species on modifying surface water chemistry, based on long-term monitoring data. The third component will explore the linkage between nonnative species and ecosystem functioning in the Great Lakes basin by considering possible outcomes of the loss of nonnative species in light of evidence available in the scientific literature.

Gibson, D., and G. Wichert. Gartner Lee Limited, Toronto, ON
(dgibson@gartnerlee.com)

A Stream Sensitivity Assessment Tool Developed For Standardizing Baseline Condition Reports

A Stream Sensitivity Assessment Tool was developed using both primary fisheries data collected in the field by Gartner Lee Limited (GLL) and secondary source data. The goal of the Stream Sensitivity Assessment Tool is to create a consistent and defensible method of reporting baseline conditions to illustrate the fish and fish habitat characteristics that are essential to the decision making process. GLL electrofishing surveys are used to assess water quality and water temperature characteristics at sampling stations. Data obtained from the Ministry of Natural Resources and local Conservation Authorities are used to determine the historic locations of Species at Risk and for stream thermal designations (i.e. cold, cool, warm water). Groundwater/ surface water interaction tools are also used to determine groundwater contributions to each watercourse.

Fish community sampling results are subjected to a Species Associated Tolerance Index (SATI) for Water Quality (WQ) and Water Temperature (WT)(Wichert, 1995). The SATI-WQ score assigns individual fish a species tolerance score (STS) based on the degree of intolerance to four water quality criteria: chloride concentration, low dissolved oxygen concentration, increased turbidity/ sediment loading and physical habitat destruction. The SATI-WT score assigns a final temperature preferendum (FTP) for the fish communities located at each of the sampling locations. In addition, qualitative assessments of fish habitat are conducted using the Rapid Assessment Method (RAM) of the Ontario Stream Assessment Protocol (OSAP 2003, version 5.1).

The analysis results are then combined and displayed on one technical map to illustrate to decision makers the fish and fish habitat characteristics at each sampling location quantitatively and qualitatively. Finally, based on all of the individual results, an estimate of overall stream sensitivity is determined for each stream reach. Findings from this approach provide a consistent and defensible method of reporting baseline conditions and an overall assessment of the stream's ability to withstand both natural and/ or anthropogenic factors that result in environmental change.

Harvey, H. Bait Association of Ontario, Peterborough, ON
(harold_harvey@hotmail.com)

The Bait Association of Ontario: issues and solutions.

The bait industry in Ontario comprises 1900 licenced harvesters plus dealers and employs some 5000 part/ fulltime designates and helpers. The bait industry has been valued variously ranging from $20-$40 million annually. It exists in support of the billion dollar recreational fishery. The industry is represented by the Bait Association of Ontario, expressed through an elected board of directors representing harvesters and dealers in four districts of Ontario. Bait harvesting is licenced by the Ontario Ministry of Natural Resources in defined geographic locations, bait harvest areas, annually renewable. Harvest is constrained by access and market forces. The bait industry is the only natural resource-based industry unsupported by research.

The bait industry faces a plethora of problems, including alien species, species at risk, loss of fish habitat, declining interest in angling, and fish epidemics. The presentation will discuss some of the initiatives of the industry to combat these problems.

Haddrath, O[1], and J. Smitka[2].
[1]Royal Ontario Museum, [2] Trout Unlimited, Canada. (smitka@stn.net)

Bringing Back the Salmon.

When Europeans first arrived in the lands surrounding Lake Ontario, they found a lake teeming with Atlantic salmon. The clearing of the land and damming of the rivers that followed settlement around the lake changed both the terrestrial and aquatic habitats. By 1896, the salmon were gone. Despite a major push to restore the habitat, restocking (experimental) the lake with several million Atlantic salmon has failed to establish a self sustaining population. DNA recovered from 150 year-old specimen mounts of Lake Ontario Atlantic salmon from the Royal Ontario Museum's collections may hold the key in this restoration effort. The DNA sequences recovered from these mounts will identify whether this population was unique and thus likely to be specially adapted to this freshwater habitat. Additionally, these sequences will allow us to identify any populations that are descendants or close relatives of the extinct population and are

likely better adapted for survival in Lake Ontario than the fish stocks currently being introduced.

Jones, C.F.[1], Donald Baird[2], Michelle Bowman[3], Graham Cameron[4], Brian Craig[5], Brad Cutler[6], Joshua Diamond[7], Nicole Dmytrow[8,1], Martha Nicol[8], Jim Parker[9], Tim Pascoe[10], Hague Vaughan[5], and Graham Whitelaw[11] (Chris.Jones@ene.gov.on.ca)
[1]Ontario Ministry of Environment, Dorset Environmental Science Centre, Dorset, Ontario [2]Environment Canada, National Water Research Institute, University of New Brunswick, Fredericton, New Brunswick, [3]University of Toronto, Department of Zoology, Toronto, Ontario, [4]Ontario Ministry of Natural Resources, Peterborough, Ontario, [5]Environment Canada, Ecological Monitoring and Assessment Network Coordinating Office, Burlington, Ontario, [6]Intrinsic Consulting, Oakville, Ontario, [7]Niagara Peninsula Conservation Authority, Welland, Ontario, [8]Saugeen Valley Conservation Authority, Hanover, Ontario, [9]Bancroft, Ontario, [10]Environment Canada, National Water Research Institute, Burlington, Ontario, [11]University of Waterloo, Waterloo, Ontario

Performance of Ontario's Benthos Biomonitoring Network: Impacts on Social Capital, Environmental Action, and Problem-Solving Capacity.

The Ontario Benthos Biomonitoring Network (OBBN) is a collaborative initiative in which bottom-dwelling aquatic invertebrates are used to monitor ecological condition. The Network is led by Ontario's Ministry of Environment and Environment Canada's Ecological Monitoring and Assessment Network (EMAN) Coordinating Office, and is part of the Canadian Aquatic Biomonitoring Network. This paper evaluates OBBN performance, emphasizing impacts on social capital. Social capital is the value of social networks among people and organizations (characterized by trust, cooperation, community involvement, and information sharing) that build capacity to solve problems and accomplish goals of mutual benefit. A questionnaire was used to characterize participants' reasons for participating, experience and degree of involvement, satisfaction with the Network, socio-economic status and demographics. Three hypotheses were tested: (1) that participants' social capital has increased as a result of their involvement in the Network; (2) that OBBN involvement has catalyzed an increase in participants' civic environmental action, or the effectiveness of that action; and (3) that participants' problem-solving abilities have improved as a result of their association with the Network. The most commonly cited reason for participating in the OBBN was to assess aquatic ecosystem condition. Most participants are satisfied with their Network experience. Many different parts of society are represented in the OBBN; however, participants between 20 and 39 years-of-age predominate, most are employed full-time, and the majority represents conservation authorities. Evidence supports all three hypotheses: increased social capital, increased participation in environmental activities (and the effectiveness of these actions), and increased problem-solving capacity.

Kennedy, Capt. B.D. Transport Canada, St. Catharine's, ON (kennebd@tc.gc.ca)

Changes to the federal boating regulations and what it means to fisheries professionals.

Changes to the boating regulations in Canada will impact how government, universities, and private consulting firms will conduct work on open water. This talk will discuss the changes focusing on Small Commercial vessel safety requirements and crew training/ certification requirements.

McDermid, J.L.[1], B.J. Shuter[1,2], and W.N. Sloan[2] (jmcdermid@zoo.utoronto.ca)
[1]University of Toronto, [2]Ontario Ministry of Natural Resources

Temperature preference and tolerance differences between populations of lake trout.

This study was conducted to determine whether populations of lake trout differed in thermal ecology in early life thus allowing us to predict what drives thermal habitat selection once they leave the spawning ground. Lake trout eggs were collected from two neighboring lakes in Ontario. Louisa Lake is a small, deep lake with a simple community structure whereas Opeongo Lake is much larger with a complex community structure. Fish were reared under several temperature regimes: ambient, 7, 12, and 17°C and fed to satiation for one year. Fish were measured and weighed monthly to determine growth rates. . Absolute and weight specific growth rates were highest at 12°C for both populations. At six months, lake trout reared at ambient were tested for maximum temperature tolerance by raising water temperatures at a rate of 1°C every 7 minutes. Lake trout from Opeongo Lake tolerated higher temperatures for twice as long as fish from Louisa ($t_{144} = -7.12$, $p<0.001$). Age-1 lake trout were also tested for maximum temperature tolerance and a similar pattern emerged, however Opeongo fish tolerated the higher temperatures on average four times as long as Louisa fish ($t_{73} = -4.63$, $p<0.001$). Fish used in the growth study, as well as ambient reared lake trout, were tested for temperature preference in a horizontal thermal gradient tank.. Louisa fish preferred a mean temperature of 8.95°C, while Opeongo's preferred 11.12°C. The results of the temperature preference and optimum temperature for Opeongo generally agree with those of previous studies on age-0 and age-1 lake trout, however Louisa lake trout prefer much lower temperatures than have been previously reported for lake trout. Previous studies focused on Great Lakes lake trout which have a similarly complex community structure to Opeongo. In this instance, we hypothesize that in Opeongo, littoral predation pressure forces newly hatched lake trout to leave the spawning grounds for the pelagic, where they are relatively free of cannibalistic predation pressure from adult lake trout because of the diverse and abundant pelagic prey resources available in Opeongo. However in Louisa, pelagic prey resources for adult lake trout are absent, therefore, when predation forces newly hatched lake trout out of the littoral zone, they avoid the pelagic, where cannabilistic predation pressure is high, and seek refuge in the deeper colder parts of the lake. This is the first study to find thermal

ecology differences within lake trout and to hypothesize that these differences may be mediated by predation.

McMurtry, M.J. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, ON (mike.mcmurtry@mnr.gov.on.ca)

Aquatic System Classification and its Application to the Great Lakes Conservation Blueprint for Biodiversity.

Several methods of classifying aquatic systems have been advanced, most of which focus on a subset of aquatic systems, such as lakes or streams. The variables used to classify these systems are typically available for well-studies systems, but not for the whole range of aquatic systems across the landscape: lakes, streams and their catchments, wetlands and coastal areas.

A new approach to classifying aquatic systems was developed in Ontario for the purpose of prioritizing areas in the Great Lakes region for biodiversity conservation. The Ontario Aquatic Ecosystem Classification (AEC) was derived in part from an existing methodology for streams called ALIS, or Aquatic Landscape Inventory System. The AEC was not intended as a predictor of the distribution of specific biota, but as a means of representing the full range of aquatic systems for biodiversity conservation. The AEC is based primarily on physical data available across the Great lakes catchment (excluding the Great lakes proper): area, slope, geological permeability, water storage potential and connectivity to other water features, among others.

AEC classification data were used in the coarse-filter analysis of the Great Lakes Conservation Blueprint for Biodiversity, a partnership project of the Ontario Ministry of Natural Resources and the Nature Conservancy of Canada. The coarse filter identified the best examples of each system type within each tertiary watershed of the Great Lakes basin of Ontario as targets for conservation. A subsequent fine-filter analysis captured targets for species and communities that are globally rare, at risk, disjunct or in decline. The Conservation Blueprint results and potential applications will be discussed. AEC and Conservation Blueprint data, together with metadata, are now available in the Ontario Land Information Warehouse.

E.J. CROSSMAN AWARD

The **AFS-OC** has dedicated the Best Student Paper Award at our AGM in memory of **Dr. E.J. (Ed) Crossman**. At the time of his passing, Dr. Crossman was **Curator Emeritus** of Ichthyology at the Royal Ontario Museum Centre for Biodiversity and Conservation Biology and **Professor Emeritus**, Department of Zoology, University of Toronto, a world-renowned leader in ichthyology, and an active and honoured member of the American Fisheries Society. Dr. Crossman coauthored the award winning ***Freshwater Fishes of Canada*** with his colleague **Dr. W.B. (Bev) Scott**. This comprehensive book is one of North America's most important and informative works on freshwater fishes.

Metcalfe, B.[1], N. Lester[2], R. Mackereth[3], B. Jackson[4] (bwmetcal@lakeheadu.ca)
[1]Centre for Northern Forest Ecosystem Research, Lakehead University, Thunder Bay, Ontario, [2]Harkness Laboratory of Fisheries Research, Ontario Ministry of Natural Resources, Peterborough, Ontario, [3]Centre for Northern Forest Ecosystem Research, Ontario Ministry of Natural Resources, Thunder Bay, Ontario, [4]Atikokan Area Office, Ontario Ministry of Natural Resources, Atikokan, Ontario

Influence of Light Intensity on Activity and Habitat Utilization of Walleye (*Sander Vitreus*) in Two Northwestern Ontario Lakes.

A recent habitat suitability model (HSM) for walleye (*Sander vitreus*) hypothesises that light is the primary controlling variable influencing the spatial and temporal dimensions of walleye feeding habitat. To test the HSM and evaluate the optical and thermal characteristics of walleye habitat we used telemetry to estimate foraging activity of 23 walleye in two lakes during periods of changing light intensity. The water clarity in the lakes differed (mean Secchi = 2.5m and 4.6m); however, the thermal environment, although variable, did not differ consistently between the lakes. Walleye in the stained lake were located in warmer (mean temperature = 17-19°C), shallower (mean depth = 3–7m) water, close to the depth range predicted by the HSM. In contrast, walleye in the clear lake were generally located at depths (mean depth = 6–8.5m) shallower than predicted by the model (14–19m), likely because predicted optimal light levels occurred at depths where the temperature was too cold (7–9°C). The individual activity of walleye was highly variable but the general pattern of behaviour was similar between the two lakes. Walleye activity tended to be low in the afternoon and increased as light levels declined at dusk (e.g., mean change in displacement rate = 35% between 3–5 pm, and 550% between 7–9 pm). Our results support the hypothesis that light conditions are a key element of walleye habitat; however, other factors, such as temperature, also strongly influence walleye behaviour.

Regier, H.A. University of Toronto, Toronto, ON (hregier@rogers.com)

Prescription for Great Lakes Ecosystem Protection and Restoration: Avoiding the Tipping Point of Irreversible Changes.

About a year ago President Bush announced a Great Lakes Regional Consultation, to be led by the US Environmental Protection Agency. The Consultation's purpose was to investigate the current state of the Great Lakes and their tributaries and to advise on US federal strategies with respect to their management. No formal consultative partnership with a Canadian government agency was expected, which didn't offend Canadians. A number of experienced Americans decided to organize a network, effectively a temporary NGO, to complement what was happening in the formal US Consultation. As an Americanophilic Canadian, who had lived and worked in the US for two extended periods, I was co-opted to help. Peers in the US National Wildlife Federation

assumed an organization role. The outcome was a concept paper titled as above and dated December 2005. (See www.mlui.org/ downloads/ PrescriptionGreatLakes.pdf)

Rennie, M.D. University of Toronto, Mississauga, ON (mrennie@utm.utoronto.ca)

An evaluation of condition indices for the lake whitefish *(Coregonus clupeaformis).*

Condition indices are frequently employed by fisheries researchers for the purpose of describing the health or well-being of fish in a particular population. It is also often assumed that these indices typically correlate with other more direct measures of condition, such as energy density, % fat content and % dry mass. Unfortunately, condition indices have rarely been tested against other descriptions of fish health or energy density. Here, I test two frequently employed condition indices (Fulton's condition index, Le Cren's condition index), and develop a third (relative weight) for the lake whitefish, and evaluate correlations between these indices with more widely accepted measures of fish condition (energy density, % fat, % dry mass). Because the onset of maturity represents a shift in energetic tradeoffs between growth and reproduction, as well as changes in body shape due only to gonad development (rather than deposition of fat or somatic tissue), I also explored the consequences of developing relative weight indices for both mature and immature fish. Initial results show that Fulton's condition index is most strongly correlated with other measures of fish energetics; this is likely a consequence that both Fulton's index and other measures of energetics scale positively with lake whitefish body mass. The overall performance and advantages/ disadvantages of each index are discussed.

Seilheimer, T. and P. Chow-Fraser, McMaster University, Hamilton, ON (seilhets@mcmaster.ca)

Development and use of the Wetland Fish Index to assess the quality of coastal wetlands in the Laurentian Great Lakes.

We have developed the Wetland Fish Index (WFI), a tool that can be used to assess the quality of coastal marshes. A partial canonical correspondence analysis was used to ordinate fish species along multidimensional environmental axes that accounted for anthropogenic disturbance based on temperature, conductivity, and the presence of pollutants (e.g., suspended solids and primary nutrients). Compared with other measures of fish habitat quality (e.g., Shannon–Wiener diversity index and species richness), the WFI was the only index that was significantly related to the degree of water quality degradation and wetlands condition, as indicated by an independent index of wetland quality, the Water Quality Index (WQI). WQI ranks sites according to deterioration in water quality and is statistically related to the degree of land-use alteration in wetland watersheds. We demonstrate the usefulness of the WFI for detecting intra-wetland variation between two sites in a degraded urban wetland,

Frenchman's Bay, Lake Ontario. We also use the WFI to show significant improvement of 13 wetlands in Lake Ontario since the implementation of Remedial Action Plans.

Sharma, S. University of Toronto, Toronto, ON. (ssharma@zoo.utoronto.ca)

Will northern fish populations be in hot water because of climate change?

Predicted increases in water temperature due to climate change will have large implications for aquatic ecosystems, such as on thermal habitat and potential range expansion of fish species. Warmwater fish species, such as smallmouth bass, *Micropterus dolomieu*, may have access to additional favourable thermal habitat under increased surface water temperatures, thereby pushing the northern limit of the distribution of the species further north in Canada and potentially negatively impacting lake trout and cyprinid communities. We assembled a database of summer surface water temperatures for over 13,000 lakes across Canada. The database consists of lakes with a variety of physical, chemical and biological properties. We used multiple regression to develop a nation-wide surface water temperature model. Air temperature, latitude, elevation and aspects of lake morphometry were good predictors of summer surface water temperature. Lakes with summer surface water temperatures at a minimum of 19 to 21.5 °C were spatially identified and considered to have suitable thermal habitat for smallmouth bass populations. Under several climate change scenarios, we were able to identify lakes that will contain suitable thermal habitat and therefore are vulnerable to invasion by smallmouth bass in the summers of 2050 and 2100.

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Agricultural Drains as Fish Habitat in Southwestern Ontario.

Research is needed to help ensure ecosystems heavily affected by human activities continue to provide natural-like ecosystem services that account for human functions while conserving biodiversity. Open agricultural drains represent an ideal ecosystem in which to conduct these investigations because they provide necessary drainage for crop land and may also provide habitat supporting native fish assemblages. This study tested whether warmwater watercourses maintained as agricultural drains in southwestern Ontario, Canada provide fish habitat similar to that of reference watercourses not subjected to drain maintenance. Fish assemblages and habitat features were characterized using standardized sampling protocols in 24 pairs of agricultural drains and reference watercourses matched by size, stream order and location within the same watershed. Drains and reference watercourses did not differ significantly in species richness, total fish abundance and composition, occurrence of reproductive life

stages within species, or habitat attributes expected to be altered by drain maintenance. These findings suggest that drains in southwestern Ontario provide fish habitat of similar quality to that of reference watercourses. The findings will assist fisheries and drain managers to develop drain management guidelines considering the needs of agriculture, while conserving fish biodiversity and habitat.

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Bigger is better For Walleye (Sander Vitreus) Recruitment: Modeling Maternal Effects in Harvested Populations.

Models of stock size and recruitment are often used to establish harvest quotas that will protect the long-term viability of a stock. A major assumption of these models is that the survival of offspring is independent of parentage. This assumption might not hold for a number of species, however, including the walleye (Sander vitreus), which is economically one of Canada's most important freshwater fishes. We summarize results from collaborative research and the literature that suggest that the size and age of adult female walleye affects the quality of eggs and, ultimately, the viability of offspring. We incorporated these relationships into a size-structured population model, and examined their affect on the dynamics of walleye populations under various scenarios of harvest. Our results demonstrate the degree to which the recruitment potential of a harvested population can be overestimated when maternal effects are ignored, particularly when regulations are such that they encourage the harvest of large individuals. Fisheries managers should consider the size- or age-structure of a population when deciding policy, and explicitly assess the benefits of adopting regulations that promote escapement of large, old individuals.

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Evolution of active host-attraction strategies in the freshwater mussel tribe Lampsilini (Bivalvia: Unionidae).

Most freshwater mussels (Bivalvia: Unionoida) require a host, usually a fish, to complete their life cycle. Most species of mussels show adaptations that increase the chances of glochidia larvae contacting a host. We investigated the evolutionary relationships of the freshwater mussel tribe Lampsilini including 48 of the approximately 100 extant species including 20 of the 23 recognized genera. Mitochondrial DNA sequence data (COI, 16s, and ND1) were used to create a molecular phylogeny for these species. Parsimony and Bayesian likelihood topologies revealed that the use of an active lure arose early in the evolution of the lampsiline mussels. The mantle flap lure appears to have been the first to evolve with other lure types being derived from this condition. Apparently, lures

were lost independently in several clades. Hypotheses are discussed as to how some of these lure strategies may have evolved in response to host fish species shifts and host fish prey preferences.

Poster Presentation Abstracts

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Re-evaluation of the management and conservation of lake whitefish in Ontario based on genetic diversity and divergence.

Sustainable fisheries management requires accurate delineation of stock structure to ensure long-term yields and viable fisheries. We used microsatellite DNA genetic markers to assess the genetic structure and diversity within and among several exploited populations of lake whitefish (*Coregonus clupeaformis*), which supports significant commercial and recreational fisheries in Ontario. The structure, temporal stability and effective population size of putative lake whitefish stocks in eastern Lake Ontario were assessed using contemporary and archived tissues. In contrast to management expectations, the results indicate that lake and bay breeding groups are not genetically distinct. These same genetic tools were used to assess the distinct population status of the Lake Simcoe population of lake whitefish. This population was considered threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) until recently, and is now considered as 'data deficient' due to key uncertainties regarding its status as a genetically distinct evolutionary significant unit. As well as providing key information for fisheries management, this work provides a framework for assessing hierarchical genetic diversity within and among exploited lake whitefish populations across Ontario.

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A review of the physiological and behavioural consequences of cold shock on fish.

A rapid decrease in water temperature, termed "cold shock", may result in a number of negative physiological and behavioural consequences for fishes. Sensitivity to different magnitudes of cold shock can be difficult to predict because there is a tendency for interspecific and intraspecific tolerances to vary due to different acclimation temperatures and genetic differences. Physiological responses to cold shock stress can be categorized as: primary (i.e., catecholamine and corticosteroid release into

circulation), secondary (i.e., haematological, ionoregulatory, osmoregulatory, blood enzymatic and metabolic changes) and tertiary (i.e., growth inhibition, compromised immunologic function, reduced fecundity and behavioural changes). Behavioural responses to cold shock include changes in habitat use, foraging, reproduction and migration. We reviewed available cold shock literature to synthesize current knowledge and to identify research gaps. Our objectives were to identify relevant natural and anthropogenic sources of cold shock, document the effects of cold shock on the physiology and behaviour of fish, and evaluate the adverse effects of cold shock on population dynamics, community structure and aquatic ecosystem function. We conclude by discussing management implications and identifying directions for future research.

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Do catch-and-release guidelines from state and provincial fisheries agencies conform to scientifically-based best practices?

Many recreational anglers practice catch-and-release (C-&-R), where fish are returned to the water with the presumption that they will survive. However, not all fish survive and some fish also experience significant sublethal consequences. There is compelling scientific evidence that angler behaviour and gear choice can affect the success of C-&-R as a management and conservation strategy. Because anglers often look to government natural resource agencies for guidance on how to handle and release fish properly, there is a need to assess whether their outreach materials provide the necessary information on the subject. Therefore, we evaluated the on-line C-&-R guidelines, developed by state and provincial natural resource agencies across North America, to determine whether their guidelines were consistent with the best available scientific information. Preliminary analysis indicated that there was immense variation in the depth and breadth of coverage among jurisdictions. In many cases, the guidelines failed to provide sufficient direction to actually be of use to anglers or provide direction consistent with contemporary scientific literature. This analysis will assist with disseminating outreach materials that promote sustainable recreational fisheries and that maintain the welfare status of individual fish.

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Warner Lake Ecological Observatory: Insights into fish behaviour using a whole-lake three-dimensional acoustic telemetry array.

The Warner Lake Ecological Observatory is located on the property of the Queen's University Biological Station and represents the first whole-lake experimental system capable of monitoring the behaviour of fish in three dimensions. The acoustic telemetry system uses code division multiple access protocols to enable the simultaneous real-time monitoring of numerous tagged animals. During preliminary experiments, 22 largemouth bass were implanted with acoustic transmitters in November, 2003. These transmitters provided the positional information required to generate X-Y-Z positions and temperature of each animal every 15 seconds. Individual movements across various time scales (e.g., gross daily movement to instantaneous movements) were recorded with sub-meter accuracy. During the winter, fish resided in the deep basin of Warner Lake and avoided the shallow basin. Contrary to existing paradigms that suggest largemouth bass are quiescent during the winter, fish moved extensively under the ice, exhibiting subtle but regular patterns of vertical distribution. In late March ice cover left the shallow basin before the deep basin, and the majority of individuals moved into the ice-free basin.

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Movement of Brook Trout in the Cypress River, Lake Superior.

Brook trout (*Salvelinus fontinalis*) stocks in the Lake Superior basin were systematically degraded over the past century by habitat loss, over-fishing, and exotic species. Coaster brook trout, a migratory lake-dwelling ecotype, were diminished to the point where only a few viable populations now remain. Recent evidence suggests that anadromy in brook trout populations on the Atlantic coast may be influenced by differences in individual growth potential, so in 2004-2005 we PIT (passive integrated transponder) tagged brook trout in the Cypress River, an historic coaster brook trout stream, to investigate whether growth patterns influenced brook trout movements. In-stream antennae were located near the stream mouths in the Cypress and Little Cypress rivers, 1.7 km apart. In total we tagged 379 brook trout (mean fork length 168mm, mean weight 78g). Fifty-seven and 8 brook trout were recorded in the Cypress and Little Cypress rivers respectively. There was no difference in size between fish moving into or out of Lake Superior and those fish that did not move. The vast majority of recorded movement occurred at night and dawn. Fish were moving both into and out of the Cypress River, as 29 fish were recorded moving upstream and 23 were recorded moving into the lake.

Notes

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