

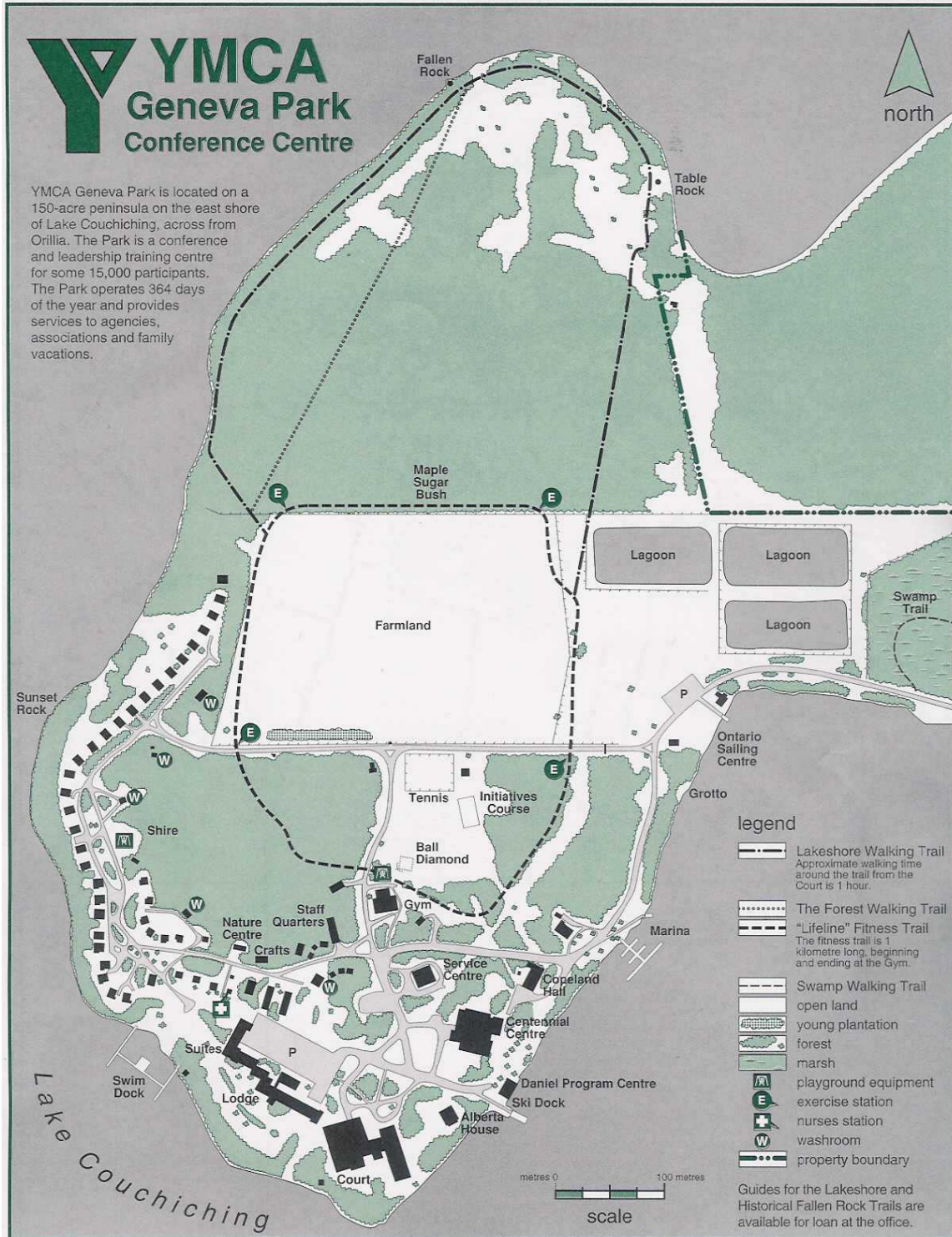


AMERICAN FISHERIES SOCIETY

ONTARIO CHAPTER
ANNUAL GENERAL MEETING

March 3rd – 5th, 2011
Geneva Park, Orillia

“Biodiversity – What does it mean to
you?”



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Thursday March 3rd

5:30 - Arrival, Registration & Opening Mixer (Geneva Lodge Lounge)

Friday March 4th

07:30 BREAKFAST (Geneva Court)

08:30 GREETING AND CONFERENCE OUTLINE (Centennial Centre Room 15)

Session 1: Managing Streams and Habitats

08:40 *Sampling non-wadeable rivers in southern Ontario with a small benthic trawl: what have we been missing?* – Jason Barnucz (Fisheries and Oceans Canada)

09:00 *A decade of fisheries monitoring in the Credit River – what is the data telling us* – Jon Clayton (Credit Valley Conservation Authority)

09:20 *What happens when a virulent fish disease shows up in your neighborhood: Michigan’s adventures with VHS* – Gary Whelan (MI Department of Natural Resources)

09:40 *Developing a Canadian approach to managing environmental flows* – James Snyder (World Wildlife Fund)

10:00 COFFEE & POSTER SESSION (Room 15 Lounge)

Session 2: Invasive Species

10:30 *Identification of high risk areas for establishment of Asian carps in the Great Lakes: a bioenergetics, behavioural, food web approach.* – Warren Currie (Fisheries and Oceans Canada)

10:50 *Invasives tracking system: an online tool for reporting and monitoring invasive species - David Copplestone (Ministry of Natural Resources)*

Session 3: Fisheries Management

11:10 *Fish response to habitat creation in Toronto Harbour - preliminary results - Nicolas Lapointe (Department of Fisheries and Oceans Canada)*

11:30 *Creating the Context for Biodiversity Management through IWM - Jack Imhof (Trout Unlimited Canada)*

11:50 *Shoreline Restoration Practices and Fish Community Response Monitoring in the Greater Toronto Area - Violetta Tkaczuk (Toronto and Region Conservation Authority)*

12:10 **LUNCH (Geneva Court) & POSTER SESSION (Room 15 Lounge)**

1:00 *Creating a new vision for fisheries habitat assessment and management: the U.S. national fish habitat action plan board's - national fish habitat assessment - Gary Whelan (MI Department of Natural Resources)*

1:20 *Fisheries fieldwork in foreign lands - Joe Tetreault (EcoMetrix Incorporated)*

1:40 *Influence of environmental factors on fish community composition on coastal wetlands of eastern Georgian Bay - Jon Midwood (McMaster University)*

2:00 *Influence of gear type on fish catch data and a fish-based index of wetland quality in coastal wetlands of Georgian Bay - Maja Cveticovic (McMaster University)*

2:20 *A morphological examination of the taxonomy of ciscoes from the Groundhog River drainage. - Sarah Hogg (Trent University)*

2:40 **COFFEE & POSTER SESSION (Room 15 Lounge)**

3:00 **PANEL DISCUSSION - agenda TBD based on member feedback**

3:30 **FREE TIME (Ice Fishing, Networking, etc.)**

5:00-6:30 **ANNUAL BUSINESS MEETING (Room 15)**

6:30-1:00 **BBQ SUPPER AND SOCIAL (Court Lounge)**

Student Posters:

Development of a national fish passage inventory for Canada: canfishpass – Charles Hatry (Carleton University)

Barriers resulting primarily from anthropogenic activities (e.g., hydropower development, irrigation, flood control, low flow augmentation) can prevent the upstream migration of fish, reducing the connectivity of river systems. As a result, great efforts have been devoted to the design and installation of fish passage facilities to enable the movement of fish across barriers. However, the literature is generally short of scientific papers dealing with fish passage design and effectiveness, making it difficult for those developing fish passage projects to determine which fishway designs are most appropriate for a given system and target species. One approach for providing information to support future fish passage projects is through the development of databases that contain detailed accounts of fish passage facilities. Described here is the development of a national fish passage database in Canada (called CanFishPass) intended to serve as a repository for information that has previously been difficult to find. The database includes detailed information such as the location, engineering details, hydraulic characteristics, and biological effectiveness of the various fish passage facilities, as well as photographs and engineering drawings when available. The database is searchable by species, fishway type, and ecozone, and includes a reference section comprised of both peer-reviewed and “grey” literature. It is anticipated that the database will serve as an important resource for future fish passage development projects enabling quantitative analyses, while also serving as the first inventory of all fish passages in Canada. Although efforts to date have been focused on Canada, the expansion to a global inventory of fish passage facilities would enable opportunities to learn directly from studies in other regions.

Short-term individual growth patterns of anadromous Arctic charr in Ungava-Labrador, Canada. – Alyssa Murdoch (University of Waterloo)

*The Arctic charr (*Salvelinus alpinus*) distribution spans a wide latitudinal range and includes some of the harshest and most variable aquatic environments known. Growth pattern differences among Arctic charr within these environments have been attributed to varying life-history strategies, environmental conditions, intra- and inter-specific interactions, and resource availability. Population somatic growth rates are commonly inferred from age-at-length data and thus represent mean growth over a given number of years averaged over the varied experiences of the fish used to compute the mean. In contrast, growth data obtained from fish tagging experiments allow a direct measure of individual growth over short periods of time that facilitate estimating the importance of specific life-history events for growth (e.g. summer marine migrations). Here, individual growth patterns of sea-run Arctic charr from two locales in north-eastern Canada are used to investigate patterns of annual and intra-seasonal growth as they vary by fish size, location, and year. Sea surface temperatures are considered as a potential determinant of growth differences and used to test the hypothesis that warmer summer temperatures increase individual growth. Where individuals were tagged upon descent and recaptured within the same season (“spring tagging”), changes in length are used to test the hypothesis that growth rate declines over the growing season, with most growth occurring at the beginning of the summer. In addition, experienced individual summer temperatures will be calculated and correlated with within-season growth rates. Annual growth data were obtained*

from tagging studies carried out in the Nepihjee River, southern Ungava Bay (from 2009-2010; n=101 recaptures) and the Ikarut River, northern Labrador (from 1981-1985; total of n=260 recaptures), where individuals were caught upon ascent during the fall migration, measured (cm), and recaptured one year later. Spring tagging data (from 1979-1987; total of n=760 recaptures) were collected from Nain Bay, Tikkoatokak Bay, and Webb Bay, in northern Labrador. Individuals were angled or gillnetted at river mouths in the nearshore marine environment during ice break-up, and recaptured from the commercial fishery later in the season. Studying individual short-term Arctic charr growth patterns facilitates improved understanding of growth variability in Arctic charr that, in turn, allows investigation of specific mechanisms driving growth. Improved knowledge of growth patterns in natural environments is critical for improving stock assessments and for sustaining population levels in the face of uncertainty over the effects of climate change on Arctic charr.

Fish stranding in freshwater systems: sources, consequences, and mitigation – Alexander Nagrodski (Carleton University)

When water levels drop in lentic and lotic freshwater ecosystems, fish can become stranded, either completely out of water, or in small, isolated pools, often having negative consequences for individuals. Stranding is a widespread phenomenon that occurs from anthropogenic (e.g., canal drawdown, hydropeaking, vessel-induced drawdown) and natural (e.g., floods, drought, winter ice dynamics) processes and has the potential to affect all life stages of fish. Here we summarize existing research on fish stranding in freshwater, discuss the consequences and mitigation options arising from previous research, and highlight current knowledge gaps. Most research pertaining to fish stranding has focused on anthropogenic activities. However, there is a paucity of research on fish stranding due to natural events such as drought, floods, and winter ice dynamics. Extensive research on salmonids downstream of hydropeaking dams has demonstrated that stranding can lead to negative consequences for fish populations and communities. Comparatively little is known about non-salmonid species or in other contexts, and in general little is known about the factors that are associated with stranding. These current knowledge gaps make it difficult to develop mitigation strategies. This review will provide fisheries managers with a much needed guide to fish stranding which should aid in supporting management decisions and identifying knowledge gaps that need to be addressed to improve the science and practice of fish stranding prediction and mitigation.

Food for thought: what are Hemimysis anomala eating in Lake Ontario and the upper St. Lawrence? - Jessica Ives (University of Waterloo)

Hemimysis anomala, (HA) the bloody red shrimp, is the latest known invader of the Great Lakes basin, having first been recorded in lakes Michigan and Ontario in 2006. Since then HA have been found in all of the Great Lakes except Superior, as well as in several locations along the St. Lawrence River. Sampling has found high density sites in both lentic and lotic environments and noted the ability of HA to integrate into contrasting food webs. As of yet, the food sources consumed by HA and their effects on food web higher trophic levels are unknown. Nevertheless, such information is necessary to accurately assess the impacts of this invader on the Great Lakes ecosystem. Samples of HA and concurrent food web items were collected between 2008 and 2010 from several sites in both Lake Ontario and the St. Lawrence River which were repetitively sampled over the year. Samples were processed for carbon and nitrogen stable isotope analysis to evaluate the diet and trophic position of HA. Mixing models were used to determine the fraction

of the HA diet contributed by benthic sources (as measured as periphyton, snails) versus pelagic sources (POM, zooplankton, mussels) at each site. Trophic levels were also compared using baseline corrected $\delta^{15}\text{N}$ values for each site. Analyses have shown some significant differences between the populations studied in the St. Lawrence and Lake Ontario, including differences in reliance on benthic and pelagic carbon sources, as well as differences in $\delta^{15}\text{N}$ values relative to a site specific baseline.



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Oral Presentation Abstracts

Friday March 5th, 08:40

Sampling non-wadeable rivers in southern Ontario with a small benthic trawl: what have we been missing?

Barnucz, J. and N.E. Mandrak (Fisheries and Oceans Canada)*

Non-wadeable river systems are one of the most challenging freshwater habitats in which to conduct fisheries sampling. Challenges are due to their diverse habitats including varying depths, flows and substrates, which require a variety of gears to sample effectively such as seines, backpack electrofishers, boat electrofishers, trammel nets, trapnets, hoopnets, and gillnets. The use of small, specialized benthic trawls has been very successful in sampling small- to medium-sized fishes in large, non-wadeable rivers in the American Midwest; however, this method had not been used in the Great Lakes basin. During 2009, Fisheries and Oceans Canada conducted trawling surveys of the Thames River. Thirty-one trawling sites were sampled over a 30 kilometre reach of river. Trawling data from 2009 was compared to 90 historical seining sites (2003, 2006) in adjacent wadeable areas to examine differences in the fish assemblage between the wadeable nearshore habitats and nonwadeable main channel habitats.

Friday March 5th, 09:00

A decade of fisheries monitoring in the Credit River – what is the data telling us

Jon Clayton (Credit Valley Conservation Authority)

In 1999, Credit Valley Conservation initiated its' Integrated Watershed Monitoring Program (IWMP). The fisheries component of this multi-disciplinary program has electrofished 90 stations from 1999 to 2008 with an average of 5 years sampled for each site. Sites were selected to represent all subwatersheds, stream orders, physiographic regions and land uses. Fisheries data

is summarized using an Index of Biotic Integrity. The overall average across all years and sites scored near the boundary between fair and good health. Present conditions represented by the last sample year, however, averaged fair, with 82.8% of the sites below the historical average. Linear regressions for stations having at least 3 years of data showed 63.5% have a negative slope or represent degradation. The strength of regressions ($R^2 > 0.49$) indicate 25.4% of the stations might be statistically significant. Stations with a strong positive slope or improving in health represented only 1.6% of the stations sampled. It is concluded that there is likely widespread degradation occurring with the fish communities of the Credit River. Power analysis further recommended that at least 8 years of data should be relied on as being statistically significant. At present 23 or 25% of the stations have 8 years of data. Of these sites 14 areas are degrading and require immediate investigation and action. Species diversity increases downstream but fish biomass and IBI scores may tend to decline. The rate of degradation is stronger in the upper regions. A preliminary analysis of rural vs. urban sites shows IBI average scores were good for rural sites and fair for urban sites despite species diversity being more similar. Further cause and effect relationships need to be investigated with other disciplines representing a range of habitat conditions. At present there is no agreement of results related to groundwater, baseflows, sediment and some water quality parameters reported. In particular, more analysis is recommended with hydrological and geomorphic indicators of environmental stability or reference conditions.

Friday March 5th, 09:20

What happens when a virulent fish disease shows up in your neighborhood: Michigan's adventures with VHS

Gary Whelan (MI Department of Natural Resources)

In 2005, a new virulent pathogen, Viral Hemorrhagic Septicemia virus (VHSV - Type IVb), was first identified with an epizootic event in the Great Lakes with subsequent mortality events detected from 2006 to 2009. This paper address how a fisheries agency (MI DNR - Fisheries Division) responded to this challenge and traces the process from chaos and confusion to active management against the pathogen. The fisheries management tool box used to deal with VHSV ranged from improved testing to broad ranging surveillance to changes in fish stocking to angler regulations. The changes in approach started in 2006 with initial extreme caution based on a general lack of information on VHSV to the current active risk management program based on a cumulative summary of all of the new VHSV data concerning species susceptibility, detection locations, disease course, disinfection, and vertical transmission.

Friday March 5th, 09:40

Developing a Canadian approach to managing environmental flows

James Snyder (World Wildlife Fund)

ABSTRACT NOT RECEIVED

Friday March 5th, 10:30

Identification of high risk areas for establishment of asian carps in the Great Lakes: a bioenergetics, behavioural, food web approach

Warren Currie (Fisheries and Oceans Canada)

*There is mounting concern regarding the potential for invasion of the Asian Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*) into the Laurentian Great Lakes ecosystem. In the Mississippi River system where these carps have established, they now account for more than 90% of the biomass of fishes. Asian carps differ from other invading freshwater fishes in that they are an active, large bodied planktivore that can consume a wide diversity of prey. Silver carp are considered phytoplanktivorous, consuming phytoplankton down to 3-4 microns (including cyanobacteria), but also consume a wide range of zooplankton, and while Bighead Carp are considered primarily zooplanktivorous, they also consume algal food. Both carp species are highly opportunistic feeders and will also consume members of the microbial food web. Given the threat to the multi-billion dollar Great Lakes economy, Canada and the US have established the Bi-national Asian Carp Risk Assessment Action Plan to determine risks of arrival, survival, establishment, spread and ecological impacts. Asian Carp range is not likely to be restricted by climatic conditions but rather food resources and spawning habitat. Here I will review the bioenergetics and food requirements of Asian Carps and discuss how high-risk regions for establishment within the Great Lakes can be identified using an individual-based modeling approach based on estimates of primary production, algae and zooplankton.*

Friday March 5th, 10:50

Invasives tracking system: an online tool for reporting and monitoring invasive species

David Coppstone (Ministry of Natural Resources)

ABSTRACT NOT RECEIVED

Friday March 5th, 11:10

Fish response to habitat creation in Toronto Harbour – preliminary results

Nicolas W. R. Lapointe, Meg St. John, Susan E. Doka, and Steven J. Cooke (Fisheries and Oceans Canada).

Coastal wetlands provide critical habitat for fishes in the Laurentian Great Lakes but have been greatly diminished by anthropogenic activities. Various restoration efforts are being implemented yet little information exists on biotic responses to these efforts. Such information is critical for assessing the effectiveness of restoration efforts. Our objectives are to assess responses of key fish species to habitat creation efforts, and to estimate seasonal habitat preferences, particularly in winter. In the first year of the study, our focus is to deploy and test an acoustic telemetry array and to evaluate macro and mesohabitat selection and large-scale fish movements. Transmitters,

including pressure and temperature sensors, were implanted in 51 fishes in September 2010, including largemouth bass, northern pike and common carp. These species include top piscivores and a super-abundant invader of key interest to managers. Detection data were retrieved from receivers in November 2010, and will be retrieved again in March, 2011. Preliminary results showed considerable habitat partitioning among species with respect to depth but not temperature. Northern pike selected the deepest habitat, followed by common carp, though all three species moved deeper as the season progressed. Largemouth bass primarily remained in protected embayments, with two individuals moving to the Toronto Islands area. Certain northern pike also selected embayment habitats, though many were also found in the open waters of the harbour. Common carp demonstrated the greatest movements, and 1/3 of tagged fish dispersed from the Harbour. Carp that remained resident selected both embayments and open-water habitat. Results will inform redeployment of the array in summer 2011 to capture real-time, two-dimensional movements and habitat selection of fishes. Transmitters will be implanted in additional fishes, and possibly additional species such as walleye.

Friday March 5th, 11:30

Creating the Context for Biodiversity Management through IWM

Jack Imhof (Trout Unlimited Canada)

The functioning of landscapes through the interplay of geology, topography and climate creates the opportunities for life. Without understanding our landscape does or could function, it is almost impossible to protect and restore biodiversity. This paper explores the usefulness of Integrated Watershed Management as a major landscape level tool for creating the context by which we plan, manage and restore the biodiversity of our watersheds and the aquatic life found within them.

Friday March 5th, 11:50

Shoreline Restoration Practices and Fish Community Response Monitoring in the Greater Toronto Area

Violetta Tkaczuk (Toronto and Region Conservation Authority)

Toronto and Region Conservation Authority has led the restoration and enhancement of habitats along the shores of Lake Wilcox, one of the largest lakes on the Oak Ridges Moraine. Lake Wilcox is located at the north end of the Town of Richmond Hill in York Region within the headwaters of the East Humber River Watershed. This inland kettle lake, surrounded by housing complexes and fast growing communities, had reached a state of degradation limiting many of the critical ecological components which facilitate the natural function of the lake. The restoration work focused on the east shore of Lake Wilcox where over the years the shoreline had become degraded as a result of bank erosion due to high public use and overgrazing of critical aquatic vegetation by migratory waterfowl. The shoreline was absent of emergent vegetation, lacked structural diversity, and did not provide any substantial habitat for local fish and wildlife.

Through extensive planning and consultation, a strategic natural shoreline enhancement plan was developed, and implementation of aquatic habitats began in the summer of 2008. Species specific essential habitats that target a range of life stages of fish, herpetiles, waterbirds, mammals and invertebrate communities were created and enhanced. Projects included fish spawning habitat, amphibian pools, in-water and shoreline structural habitat, diversified substrates, weedy pockets and pools, transitional habitat zones and emergent vegetation zones. The restoration work has created a structurally complex shoreline typical of a natural kettle lake on the Oak Ridges Moraine which will work to increase fish productivity and the overall health of the lake. A range of monitoring programs have been undertaken including sediment sampling, water quality testing, vegetation mapping, and fish community analysis. Since 2001 the fish community at Lake Wilcox has been monitored annually using a Smith Root SR-18 electrofishing vessel. The extent of data obtained at Lake Wilcox pre, during and post restoration work, presents an opportunity to gain valuable insight and information concerning the response of fish communities to nearshore restoration work. Fish community monitoring data obtained in 2010 marks the first year of true post shoreline restoration data. Future monitoring will continue to track the effects shoreline restoration work has on the biological communities and the overall health of Lake Wilcox.

Friday March 5th, 1:00

Creating a new visions for fisheries habitat assessment and management: the U.S. national fish habitat action plan board's - national fish habitat assessment

Gary Whelan (MI Department of Natural Resources)

The National Fish Habitat Action Plan (NFHAP) is a voluntary science-based effort to protect, rehabilitate and improve the nation's aquatic habitat. A key component of the science basis is a 2010 national assessment of the nation's fish habitat, eventually extending from the mountains to the shelf. The assessment focuses on ecosystem process impairments, summarizing large amounts of system data to support Board and Partnership decisions on where to focus efforts, measure plan success, and allow lessons learned to be applied between similar systems. The system is designed for information input from any spatial scale, and allows for both vertical (aggregating habitat condition scores) and horizontal (comparisons between systems using system classification) fish habitat condition analysis. Condition analysis will focus on six emergent landscape processes that control fish habitat: hydrology, bottom and channel form to include living habitat (i.e. submerged aquatic vegetation and mussel shoals), material recruitment, connectivity, water quality, and energy flow. Initially, the assessment will use surrogate variables from national datasets taken in a consistent fashion and meaningful to structuring fish habitat. Future assessments will use detailed process related variables from Fish Habitat Partnership habitat assessments and will examine if systems are within the expected natural variability for each process variable, a scale-less analysis that can be done at any spatial unit, to determine their level of impairment.

Friday March 5th, 1:20

Fisheries fieldwork in foreign lands

Joseph C. Tetreault and Robert J. Eakins (EcoMetrix Incorporated)*

Conducting fisheries surveys in foreign lands can be challenging and problematic from both a logistical and biological perspective. Over the last several years EcoMetrix Incorporated has conducted a number of fisheries surveys in Peru as part of larger baseline and monitoring studies. Working in Peru involves travelling to exotic locations, seeing some unique sights and meeting interesting people. Travelling to and around Peru poses many logistical hurdles due to the remoteness of the project sites. Aquatic baseline studies we undertaken in northern Peru in support of a proposed copper mine. These studies included fish community assessment within high gradient streams and large rivers in both the Atlantic (Amazon River) and Pacific drainages in the Cajamarca province. Fish collections were conducted using a backpack electrofisher and dip net. The surveys resulted in the capture of approximately 40 species. These included 11 Naked Sucker-mouth Catfishes, 10 Armoured Catfishes, 2 Pencil Catfishes, 3 other Catfishes, 7 Tetras, 3 Cichlids, 1 Goby, 1 South American Darter and 1 Salmon species. Most specimens sent to the Peruvian Museum of Natural History could only be identified to the genus level. While some may represent new undescribed species, many likely reflect the lack of resources available to identify fish in this part of the world to the species level. Similar to North America, introductions of nonnative fishes into freshwater ecosystems in Peru threaten biodiversity. Transfers of native species of fishes between Atlantic and Pacific drainages have also occurred. If you can manage the challenges associated with fisheries work in foreign countries like Peru, the rewards can be great. Who knew all the interesting places you can visit and the different cultures you can experience through the fisheries profession?

Friday March 5th, 1:40

Influence of environmental factors on fish community composition on coastal wetlands of eastern Georgian Bay

J.D. Midwood & P. Chow-Fraser (McMaster University)

For this study, we evaluated the fish community in two coastal wetland complexes in two regions of eastern Georgian Bay. Despite the close proximity of these two complexes, we found significant differences in the fish community. We attribute these differences to environmental factors such as plant community composition and substrate type.

Friday March 5th, 2:00

Influence of gear type on fish catch data and a fish-based index of wetland quality in coastal wetlands of Georgian Bay

Kristina Kostuk, Maja Coetkovic, Patricia Chow-Fraser (McMaster University)*

In this study we assess two commonly used methods, fyke nets and boat electrofishing, in the coastal wetlands of Georgian Bay, Lake Huron. We look at the effect of gear bias on fish catch data and scores of a published fish-based index of ecosystem health, the Wetland Fish Index. This research has the potential to inform researchers and ecosystem managers of the gear biases associated with fyke nets and boat electrofishing, and the related effects on a published fish index.

Friday March 5th, 2:30

A morphological examination of the taxonomy of ciscoes from the Groundhog River drainage.

Sarah E. Hogg & Scott M. Reid (Trent University)

*We examined the morphological characteristics of cisco (*Coregonus* sp.) from four lakes (Carty, Harold, Scorch and Wakagami Lakes) in the Groundhog River drainage to: (1) investigate the morphological variation between lakes, and (2) determine if there was any evidence to support historical *C. reighardi* records in the area. Specimens from each of the four lakes were examined and 19 morphometric measurements and 6 meristic counts were taken (Vuorinen et al., 1993). After correcting for the effect of body size, discriminant function analysis (DFA) and one-way analysis of variance (ANOVAs) were used for morphometric and meristic measurements to determine whether overall morphology and individual characters differed between lakes. DFAs performed on both meristic and morphometric characters indicated that cisco populations differed significantly between lakes ($p < 0.001$). One-way ANOVA with sequential Bonferroni corrections indicated that 21 of 28 characters differed significantly between lakes. No evidence to support the existence of *C. reighardi* was found however, fish from all lakes were darkly pigmented and superficially resembled *C. nigripinnis*. Further analyses are required to determine which *Coregonus* species the fish in these lakes represent.*

Saturday March 6th, 09:00

Factors affecting differential mercury levels in land locked and anadromous Arctic charr (*Salvelinus alpinus*) from Labrador.

S. Dorn, D. Muir, B. Dempson, and M. Power (University of Waterloo)

Earlier studies have shown that anadromous Arctic charr have lower total mercury concentrations (THg) than conspecifics from nearby lake resident populations. Previously, mercury concentrations in many fish species have been positively related to age, size, and trophic level (TL). In some species, a negative relationship between mercury and growth rate, suggestive of a growth dilution effect, has been found. Possible explanations of the phenomenon in Arctic charr include: 1) growth dilution, with faster growing fish expected to have lower THg; 2) differences in trophic structure between the marine and lacustrine foodwebs, with individuals feeding at a higher TL expected to have higher THg; and 3) differences in the THg of prey items at a given TL, with individuals consuming high mercury prey expected to have higher THg. Anadromous Arctic charr were collected from the Fraser River in Labrador (56°37'44.62"N, 62°31'12.85"W), and lake residents were obtained from Coady's Pond #2 (56°38'30.55"N, 63°37'30.51"W), 68 km west of the anadromous collection site. Dorsal muscle samples were

used for matched THg and stable isotope analyses and combined with similar analyses of foodweb items (e.g., forage fish, zooplankton, insect larvae, molluscs, amphipods, algae) obtained from the lacustrine and marine environments. Mercury concentrations in lacustrine Arctic charr from Coady's Pond #2 (THg = 119 ± 42 $\mu\text{g}/\text{kg}$) were 6 times higher than those found in the anadromous charr from the Fraser River (THg = 21.6 ± 7.6 $\mu\text{g}/\text{kg}$). The difference in THg was not due to growth dilution, as charr from both environments grew similarly as indicated by an ANCOVA used to compare \ln age versus \ln length in Arctic charr from the two locations. Anadromous Arctic charr had a significantly higher average trophic level (TL = 3.7 ± 0.12) than lacustrine charr (TL = 3.2 ± 0.13). Therefore, the lower THg concentrations found in the anadromous Arctic charr cannot be attributed to consistent use of lower trophic level prey resources. Current efforts are focused on examining the remaining hypothesis that the THg in foodweb items collected from the lacustrine and marine foodwebs are different, and that the lower THg of anadromous charr is related to lower average prey mercury concentrations.

Saturday March 6th, 09:20

Consideration of uncertainty in the design and use of harvest control rules

Jiao, Y., Reid, K. and T. Nudds (Ontario Commercial Fisheries Association)

Harvest control rules are widely used by management agencies for decision-making and for promoting public awareness of the status of marine and freshwater fisheries. Many current control rules combine fishing mortality and biomass-based biological reference points. Control rules were introduced as a precaution against the influence of uncertainty and to decrease the risk of overfishing, but are compromised if the uncertainties of the biological reference points are not explicitly considered. Uncertainty has been widely acknowledged but has not been incorporated into control rule design and application. In this paper, we used a Bayesian statistical catch-at-age model to estimate uncertainties in the indicators of fishing mortality, population size, and biological reference points. We apply this model to the Lake Erie walleye (*Sander vitreus*) fishery, and by fully considering the uncertainty of the indicators, the risk of overfishing and the risk of the population being overfished can be explicitly estimated in the control rules. We suggest short and long-term approaches to incorporate uncertainty in the design of control rules. We also suggest that control rules for specific fisheries should be designed with explicit consideration of the uncertainty of the biological reference points, based on a negotiated risk level that is mutually acceptable to both managers and stakeholders.

Saturday March 6th, 09:40

Behaviour and passage success using a vertical slot fishway in Quebec: case studies incorporating a single and multispecies approach.

J. D. Thiem*, T. R. Binder, J. W. Dawson, P. Dumont, D. Hatin, C. Hatry, C. Katopodis, K. Smokorowski, K. Stamplecoskie, D. Zhu and S. J. Cooke (Carleton University)

The freshwater spawning migrations of many species have been influenced by the development dams which create barriers to migration. Although fishways are commonly installed to reinstate

passage at these sites, their success at passing target species often remains unknown. We conducted two field studies at a vertical slot fishway on the Richelieu River in Quebec during May and June 2010 to: 1) determine passage success of lake sturgeon at the fishway and, 2) examine the utility of this fishway as a model for a multispecies approach. An extensive Passive Integrated Transponder (PIT) antenna array enabled us to quantify passage success, passage rates and determine the spatial location of individuals. In the first study, migratory lake sturgeon ($n=107$, 939–1625 mm TL) were captured, PIT tagged and released into the fishway. Sturgeon exhibited an ability to traverse the 70 m fishway quickly (minimum passage rate of 1.2 hrs), however, successful passage rates were variable (6.2–75.4 hrs from release) and only 30% successfully ascended. In the second study, 17 species comprising 492 individuals were captured in a fish trap, PIT tagged and released into the fishway. Passage efficiency was highly variable among species (range 0–100%), however >50% for seven of the species encountered (Atlantic salmon, carp, channel catfish, freshwater drum, smallmouth bass, walleye and white sucker). Passage rates were likewise highly variable both among and within species (e.g., 1.0–452.9 hrs for smallmouth bass, 2.4–237.5 hrs for shorthead redhorse). These results will be discussed in the context of balancing fishway design for priority species while maintaining diversity.

Saturday March 6th, 10:00

Stream Corridors and Restoration of Ontario's Biodiversity

Jack Imhof (Trout Unlimited Canada)

Rivers scroll through our landscape creating ribbons of blue and green and providing many opportunities for animals and plants. We have neglected these corridors and need to consider them as integral components of a watershed's natural infrastructure creating the dynamic habitat and opportunities for life. This presentation outlines the rationale and imperative for restoring and managing these critical features on our landscape to provide healthy environments for people and as a way to restore our biodiversity heritage.

Saturday March 6th, 11:00

The status of inland fisheries: perspectives from North America and beyond

Steven J. Cooke, Karen J. Murchie, Robert Arlinghaus, Devin Bartley, Sena de Silva, Peter McIntyre, Ian G. Cowx, and T. Douglas Beard (Carleton University)

Inland fisheries provide a vital source of commerce, employment, nutrition, and recreation for people throughout the world. This is particularly so in small-scale subsistence and artisanal inland fisheries, where fisheries are critical for the food security and livelihoods of millions of rural poor people. In developed nations, and increasingly in developing nations, the importance of inland fisheries shifts toward recreation, but still constitutes a major economic activity facing numerous management challenges. In both the developed and developing world, inland waters suffer from multiple competing demands for water (e.g., hydropower, withdrawal for agriculture, industrial processes, or transportation), resulting in management tradeoffs between fish/fisheries and other uses. Here we present an overview of the status of fisheries in

North America relative to other developed and developing regions of the world. Our objective is to highlight the importance of inland fisheries resources, summarize the threats that they face, identify similarities and differences between developed and developed countries, and suggest strategies for addressing this hidden crisis. We conclude that the complexity and uncertainty inherent in decisions about managing water resources requires an ecosystem approach that involves stakeholders from all sectors. Also needed is greater appreciation of fish in inland waters and the diverse ecosystem services that they provide. Failure to protect fish biodiversity in inland waters will not only have dire ecological consequences, but will also influence regional and national economies and the livelihoods and nutritional security of millions of people around the world.

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Timing and environmental cues to Lake Sturgeon (*Acipenser fulvescens*) migrations

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Lake Sturgeon (*Acipenser fulvescens*) is of conservation concern across its entire range. Current estimates suggest that sturgeon numbers in the Great Lakes are less than 1% of their historic abundance due to historical overharvest and altered access and conditions for tributary habitats. In this study, the migration patterns, timing, and environmental cues to Lake Sturgeon migration within the Pic River (northeastern Lake Superior tributary) were examined using radio telemetry over a three year period (2008-2010). Lake Sturgeon were captured using gill nets and radio tagged (N=47) throughout the course of the study. Their movements within the river were monitored using three automatic base station receivers and by manually tracking individuals from boats during the spring and summer. Abiotic conditions, including temperature, flow, and ice conditions, were also monitored during this time to determine environmental cues that were responsible for stimulating the onset and termination of Lake Sturgeon migration. Three unique migration patterns were observed within the Pic River, two of which were related to foraging individuals and one related to spawning individuals. Spawning individuals entered the river earlier and rapidly ascended the river to the uppermost barrier (~100km), whereas foraging individuals either remained at the mouth of the river or migrated 20km to 30km upriver. An unusually warm spring and early melt in 2010 resulted in Lake Sturgeon entering and exiting the river roughly 50 days earlier compared to the previous two years. The onset and termination of their migrations were highly correlated with ice conditions and when the river became ice free ($R^2=0.88$); however, water temperature and discharge were not able to accurately predict the timing of Lake Sturgeon migration. Critical habitat was also identified within the river and classified in order to identify physical features that are responsible for attracting Lake Sturgeon. This study successfully identified the timing, patterns, and environmental cues of Lake Sturgeon migration within the Pic River. Furthermore, the identification of critical habitat within the Pic River is essential and results suggest that this habitat warrants greater protection in order to ensure the long term viability of this Lake Sturgeon population.

NOTES



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