



AMERICAN FISHERIES SOCIETY

**ONTARIO CHAPTER**  
**ANNUAL GENERAL MEETING**

February 26 - 28, 2015  
Geneva Park, Orillia, ON

*“Moving Forward Following a Wave of  
Change”*

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## ONTARIO CHAPTER

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## “Moving Forward Following a Wave of Change”

### Thursday February 26

5:30-on Arrival, Registration (Front Desk)

8:00-10:00 Opening Mixer (Lodge Lounge Hospitality Suite)

### Friday February 27

7:30-8:30 BREAKFAST (Geneva Court)

08:30 GREETING AND CONFERENCE OUTLINE (Auditorium)

08:40 *Keynote Talk: America's Experiment with Voluntary Landscape Scale Aquatic Habitat Protection and Rehabilitation: Some thoughts about the first 10 years of the National Fish Habitat Partnership (NFHP).* **Gary Whelan, Michigan Department of Natural Resources \***

### Session 1

09:20 *Talk 1: Fisheries and Oceans Canada's Asian Carp early detection surveillance program.* **David Marson\***

09:40 *Talk 2: Investigating the influence of land use and water quality on the production of algae along the shoreline of Lake Huron.* **Samantha Stefanoff\***, Todd Howell, and Sapna Sharma

10:00 *Talk 3: Mechanically Stabilized Soil Encapsulation Systems as an alternative to hardscapes for erosion control, steep slope stability and shoreline restoration.* **Jay Morgan\*** (Envirolok Canada)

10:20 COFFEE, TRADE SHOW, POSTER SESSION (Auditorium and Lobby), Equipment Showcase (Room 8)

Session 2

- 10:30 **Talk 4: Changes to the Fisheries Act, David Browne\***
- 10:50 **Talk 5: Panic at the cisco: Predicting the effects of climate change on Cisco distributions in Ontario. Miranda Chen\*** and Sapna Sharma
- 11:10 **Talk 6: Lampricide Impairs Olfaction in Young-of-the-Year Lake Sturgeon (*Acipenser fulvescens*). Kathrine Sakamoto\***, William A. Dew, Stephen J. Hecnar<sup>1</sup>, Gregory G. Pyle.
- 11:30 **Talk 7: Distribution and Life History Observations of River Darter (*Percina shumardi*) In Historical and New Locations throughout Northwestern Ontario. Bill Gardner\***
- 11:50 **Talk 8: Hydrodynamic Characteristics of Critical Walleye and Lake Sturgeon Spawning Habitat below a Hydroelectric Dam in the Rainy River, Ontario. Jeff Muirhead\***
- 12:10 **LUNCH (Dining Hall), TRADE SHOW (Lobby) & POSTER SESSION (AUDITORIUM), EQUIPMENT SHOWCASE (Room 8)**

Session 3:

- 1:00 **Talk 9: eDNA Methods Workshop/presentation, Kristyne Wozney\***
- 2:00 **Talk 10: Do angling technique and lure type selectively target fishes based on their behavioural type? Jacob W. Brownscombe\***, Alexander D.M. Wilson, Brittany Sullivan, Sofia M.R. Jain-Schlaepfer, Steven J. Cooke
- 2:20 **Talk 11: Filtrexx Stream Restoration. Ron Bisailon\* and Miles Torch, Filtrexx Canada**
- 2:40 **Talk 12: Stream Restoration for Endangered Species. Heather Amirault\* (Stantec)**
- 3:00 **COFFEE, TRADE SHOW & POSTER SESSION (Lobby and Auditorium), EQUIPMENT SHOWCASE (Room 8)**
- 3:35-5:00 **ANNUAL BUSINESS MEETING (Auditorium)**
- 3:35 or 5:00-6:30 **TRADE SHOW, POSTER SESSION, ICE FISHING**
- 6:30- 7:00 **DINNER (Dining Room)**
- 7:00-10:00 **MENTORSHIP LAUNCH AND SOCIAL (GENEVA COURT LOUNGE)**

**Saturday February 28<sup>th</sup>**

**7:30-8:30 BREAKFAST (Dining Room)**

**Session 4:**

- 08:30** *Talk 13: Rekindling the Association with the Declining American Eel through Stewardship.* **Colleen Burliuk\*** and John M. Casselman
- 08:50** *Talk 14: Temperature effects on the resting metabolic rates of early developmental Brook Trout.* **Catharine Cook\***
- 09:10** *Talk 15: Research Diving presentation.* **Dr. Nigel Waltho\***
- 09:30** *Talk 17: Impacts of dredging on fish species at risk in Lake St. Clair, Ontario.* **Jason Barnucz\***, N.E. Mandrak, L.D. Bouvier, R. Gaspardy and D.A. Price
- 09:50** *Talk 18: Phenotypic divergence of early life history traits among introduced Great Lakes Chinook Salmon populations.* **Micheal Thorn\***

**10:10 COFFEE & POSTER SESSION (Auditorium and Lobby), EQUIPMENT SHOWCASE (Room 8)**

**Session 5:**

- 10:30** *Talk 19: Integrated approaches for evaluating the spatial ecology and movement behaviours of migratory giant Amazonian catfish, Dourada (Brachyplatystoma rousseauxii).* **Taylor Ward\***, Lisiane Hahn, Vivian Nguyen, Michael Power, Pricscila Lopes and Steven Cooke.
- 10:50** *Talk 21: Silver Shiner: Habitat Descriptions and Distribution in Ontario.* **Robin Gaspardy\***, Barnucz, J., Bouvier, L., Glass, W., and Mandrak, N.
- 11:10** *Predicting The Effects Of Climate Change On Walleye And Smallmouth Bass Distributions In Ontario Inland Lakes: Are Walleye In A Pickle-Rel?* **Van Zuiden, T.\***, Stefanoff, S. and S. Sharma
- 11:30** *Littoral Fish Community Changes In Southeastern Ontario.* **Finigan, P.\***, Mandrak, N. and B. Tufts.
- 11:50 PRESENTATION OF STUDENT AWARDS AND CONFERENCE WRAP (Auditorium)**
- 12:15 LUNCH (Dining Room)**



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## Poster Presentation Abstracts

*Behavioural Guidance of Largemouth Bass Using Light Emitting Diodes*

**Sullivan, B.**, Cooke, S.J., Wilson A.D.M., Patrick, P., Sills, M.; Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, Ottawa, Canada ([brittanysullivan@cmail.carleton.ca](mailto:brittanysullivan@cmail.carleton.ca))

Freshwater ecosystems are threatened by the infrastructure related to hydropower development, irrigation and municipal water-taking as well as industrial cooling. This is especially apparent when taking into consideration the risk of entrainment or impingement that such infrastructure presents to fish. To minimize these threats, mitigative strategies have been developed which aim to direct fish away from “dangerous” areas to “safer” areas. Behavioural guidance systems provide a cost effective method by exploiting the sensory physiology of a species where stimuli can be used to manipulate their natural behaviour. These systems often incorporate light, as sight is one of the primary sources of information used by fish for interacting with their external environment. Previous studies that have taken this stimulus into account for behavioural fish guidance have primarily focused on flash frequencies with white light alone and are thus limited in regards to the light spectra being explored. The primary objective of this study was therefore to investigate the behavioural responses of largemouth bass in terms of orientation and movement to varying light spectra (red, orange, yellow & green) as well as flash frequencies (120 min<sup>-1</sup>, 300 min<sup>-1</sup>, 600 min<sup>-1</sup>) as a potential form of behavioural fish guidance.

*Do exercise and air exposure affect boldness and activity level in the bluegill sunfish (*Lepomis macrochirus*)? Incorporating behavioural endpoints into catch-and-release science.*

**Christine I. L. M. Hadden**, Kathryn Dufour, Alexander D.M. Wilson and Steven J. Cooke; Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, Ottawa, ON, K1S 5B6 Canada

Fish that are captured and then released may experience altered behaviour due to exposure to stress for some period of time upon return to the water. Variation in such behavioural responses between individuals is therefore important as such differences reveal how individuals will differentially respond to stressors as well as acquire food and avoid predators. In this study, we used field-caught bluegill sunfish (*Lepomis macrochirus*) and behavioural assays to determine the effects of catch-and-release on short-term behaviour. The fish were placed into individual opaque plastic holding tanks and were assessed for individual differences in refuge emergence, activity, and flight-initiation-distance (FID) as well as several estimates of stress and condition (e.g. opercular count, reflex-action-mortality-predictors [RAMP]) before they were exposed to various combinations of exercise and air exposure (or control) treatments. Fish were exercised for 0s, 30s, or 120s, and exposed to air for 0s, 60s, or 500s. Afterwards, the fish were left for one hour, and behaviour was reassessed. Contrary to initial expectations, the majority of bluegill did not exit the refuge or explore their experimental arena. Tests for opercular count, FID and RAMP were conducted on fish, regardless of the results of the refuge emergence test. Operculum count and RAMP were not effective predictors for fish behaviour. As well, we detected no differences in FID among air exposure and exercise treatments. This study provides novel insight into using simple behavioural and reflex indicators to evaluate the short-term consequences of catch-and-release stressors.

*Predicting the Distribution and Preferred Habitat of Fish Species at Risk in a Lake St. Clair tributary, Little Bear Creek*

**Montgomery, F.A.,** Mandrak, N.E., and Reid, S.M.

Agricultural drains provide important habitat for freshwater fishes, including species at risk, but the sensitivity of fishes in these systems to physical alteration is not well understood. Little Bear Creek (LBC) drain, a tributary to Lake St. Clair in southwestern Ontario, supports six fish species listed under the Canadian Species at Risk Act. Proposed flood risk management techniques include the removal of substrate and vegetation from the creek, which may lead to the loss of critical fish habitat. To quantify the risk of drain maintenance to the species at risk in LBC, this project will identify regions of critical habitat occupied by two of the six fishes, the Threatened Pugnose Shiner (*Notropis anogenus*) and Special Concern Blackstripe Topminnow (*Fundulus notatus*). Regression trees will be used to describe macrophyte cover as a function of water depth, water velocity, stream width and turbidity. Due to the high abundance of zero captures, zero-inflated models will be related to occurrences of both species. Results of the overall species-environment analysis will inform applied drain management mitigation techniques and modelling techniques used to describe species at low abundance.

*Do physical habitat complexity and predator cues influence the baseline and stress-induced glucocorticoid responsiveness of the Checkered Puffer?*

**J. Magel,** N. Pleizier, A.D.M. Wilson, A. Shultz, M. Vera Chang, T. Moon and S.J. Cooke

As the human population continues to expand, increases in coastal development have led to the destruction of much of the world's mangrove habitat, creating problems for prey fish species that rely on these ecosystems for shelter from predators. Although fish possess a stress response mechanism that helps them respond to changes in the environment through secretion of glucocorticoid stress hormones, excess stress can have negative fitness implications for fish. However, few studies have been conducted so far to determine the effects of specific stressors, such as changes in habitat configuration, on this stress response. Our objective was therefore to examine the effects of physical habitat complexity and predator environment on the stress response of fish from mangrove communities, specifically the Checkered Puffer (*Sphoeroides testudineus*). This was accomplished by examining changes in whole-blood glucose and plasma cortisol concentrations of fish placed in artificial environments where substrate type and the presence of mangrove roots and predator cues were manipulated. Given that puffers rely on the physical complexity of mangrove habitats (i.e. mangrove roots and heterogeneous substrate) for protection from predators, we predicted that homogeneous substrate, the absence of mangrove roots, and the presence of predator cues would result in higher glucose and cortisol concentrations in the puffers. If this is the case and the removal of mangrove roots and natural substrate results in higher stress levels in mangrove-associated fish, our findings may have implications for the conservation of mangrove habitats as well as the teleost species that rely on these ecosystems for survival.

*An Experimental Test of the Homing Mechanisms Used by Nest-Guarding Male Largemouth Bass Following Displacement*

**Dufour, K.,** Gutowsky, L., Algera, D., Zolderdo, A., Pleizier, N., Dick, M., Cooke, S.J.; Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, Ottawa, Canada ([kathryndufour@cmail.carleton.ca](mailto:kathryndufour@cmail.carleton.ca))

Largemouth Bass (*Micropterus salmoides*) are the most popular sportfish in North America. In early spring, following the deposition and fertilization of eggs, males remain on their nests to guard their eggs and fry. Nest-guarding involves defending the nest against potential predators; however, aggressively-defending males also readily attack fishing lures, making them more vulnerable to angling during the parental care period. If a male is caught during an angling event, and returned to the water, it is unlikely that he will be returned to the water directly above his nest; however, previous studies show that largemouth bass males are capable of finding and returning to their nest location after displacement. This journey back to the nest is vital for the success of the brood, since any time spent away from the nest increases the exposure of eggs and fry to predation, which in turn increases the likelihood of a male abandoning his nest. However, in spite of the importance of this return to the nest, the mechanism behind the phenomenon has not previously been studied. Therefore, the primary goal of this research was to assess the homing ability of sensory-impaired male Largemouth Bass (i.e., visual, olfactory and geomagnetic impairments) relative to appropriate controls, making all treatments as temporary and as harmless as possible. Homing is common and well-studied in other fish, such as salmonids, which are thought to use a combination of vision, olfaction and magnetic navigation for long-distance journeys.

However, this experiment represents one of the first tests of homing mechanisms in non-diadromous fish and where displacement involves moving fish from a specific active nesting site rather than a general summer home range.

*The impacts of climate change on Walleye-Smallmouth Bass interactions in Ontario*

**Lianna Lopez** and Sapna Sharma; York University

Climate change is an important determining factor of future freshwater species distributions which can lead to changes in species composition and therefore, alter future biotic interactions. Our objective is to predict the changes in the co-occurrence of Walleye, a native coolwater fish, and Smallmouth Bass, an invasive warmwater fish, in 2050 and 2070. We obtained historical fish occurrence and lake morphology data from the Ontario Ministry of Natural Resources (OMNR) Aquatic Habitat Inventory and Broad-scale Monitoring programs for 9736 Ontario lakes and 126 future climate change scenarios from the Intergovernmental Panel on Climate Change for 2050 and 2070. Across Ontario, we found that walleye-bass co-occurrence is predicted to increase by 8.0%-13.1% by 2050 and 9.0%-12.7% by 2070. However, this pattern is not consistent spatially across Ontario as Walleye are predicted to become extirpated in southern Ontario and shift their range northwards, whereas Smallmouth Bass are predicted to expand their range northwards throughout Ontario. As such, we found that walleye-bass co-occurrence decreased in southern Ontario under climate change scenarios. In northern Ontario, novel competitive interactions between walleye and smallmouth bass may become apparent exacerbating the vulnerability of Walleye populations in Ontario to climate change.

*Effects of Sampling Gear and Effort on the Index of Biotic Integrity in the Huron-Erie Corridor*

**Meagan Kindree**; University of Toronto

In 1987, the International Joint Commission identified the St. Clair and Detroit rivers as Areas of Concern (AOC) in response to ongoing losses of critical fish and wildlife habitat. Implementation of remedial action plans required aquatic monitoring of these areas using the Index of Biotic Integrity (IBI) as an indicator of ecosystem health. The IBI has traditionally been calculated for AOCs based on fish community sampling using boat electrofishing; however, site conditions in the Huron-Erie corridor are characterized by relatively high water velocity and depth, which may lead to reduced capture efficiency when boat electrofishing techniques are employed. This may lead to biases in species captures (and associated IBI scores) relative to other sites in the Great Lakes basin. This project examines the influence of sampling gear type and effort on IBI scores based on statistical comparisons of paired fish community data collected using boat electrofishing and benthic trawling conducted from 2011 to 2014. In addition to testing the effect of gear type and sampling effort, the influence of IBI calculation method (Hamilton 1989, Minns et al. 1994, Edwards et al. 2006) will also be examined. Results of this study will provide guidance on the development of long-term monitoring protocols in the Huron-Erie Corridor.

*Recolonization Trends in Fish Communities Following the Restoration of a Great Lakes Coastal Wetland*

**Rook, N.A.**<sup>\*1</sup>, Mandrak, N.E.<sup>1</sup> and Reid, S.M.<sup>2</sup>; <sup>1</sup>University of Toronto, 1265 Military Trail, Toronto, ON, M1C 1A4; <sup>2</sup>Ontario Ministry of Natural Resources & Forestry, 2140 East Bank Drive, Peterborough, ON, K9J 7B8

The coastal wetlands of the Great Lakes are ecologically diverse and provide numerous functions for native species including recruitment and early survival of fishes. The wetlands of Long Point Crown Marsh, located on the north shore of Lake Erie, have experienced habitat degradation since 1999 as a result of the establishment of *Phragmites australis*. As part of an initiative to increase habitat heterogeneity and restore natural wetland function, physical dredging to re-create open-water habitat occurred 2008 to 2012. This study assesses the seasonal dynamics of fish recolonization and provides insight on how life history traits and habitat characteristics influence colonization. Fish species richness and abundance in relation to dredging treatment (newly dredged, formerly dredged, and reference sites) were quantified using data from semi-annual fish and habitat sampling conducted 2012 to 2014. Multivariate analyses will be used to investigate the relationship between habitat variables and fish community. The results of this study will have implications for managing fish communities in response to habitat restoration.

*Littoral Fish Community Changes in Southeastern Ontario*

**Finigan, P.**, Mandrak, N. and B. Tufts.; Department of Biology, Queen's University, Kingston, Ont., Canada K7L 3N6 ([finiganp@gmail.com](mailto:finiganp@gmail.com))

Canada has nearly 210 freshwater fish species. Of these species, 30% of them have been assessed to be Extirpated, Endangered, Threatened or Special Concern. With rapid loss of fish diversity, it is crucial to monitor and assess our current fish distributions. Ontario has one-quarter of a million lakes and has the largest fish diversity of any province: 128 fish species, in 24 families including 17 introduced species with established populations. Anthropogenic factors associated with increases in human populations contribute to species decline from habitat loss, habitat degradation, alien species introductions and climate change. Because Ontario is the most populated province in Canada, it is expected to be a hot spot for community change and biodiversity loss in fishes. The aim of this study was to describe fish community changes over time using assemblage data from historical and contemporary periods. To do so, we compiled historical fish assemblage data from 22 lakes. We then repeated the historical methods to create a contemporary data set. With these two data sets we can make a direct comparison of fish community changes across a large spatial scale over a large time period. Using a multivariate approach, results show a strong shift from cyprinid-dominated to centrarchid-dominated communities between time periods. Although it is suspected that there are many factors contributing to the community change, we discuss why increasing temperatures could be a major driver.

*Changes in Functional Diversity of Fish Species in the Great Lakes, 1870-2010*

**Sara E. Campbell** and Nicholas E. Mandrak; University of Toronto, 1265 Military Trail, Toronto, ON M1C 1A4

In the Great Lakes basin, the introduction of non-native species and extirpation of native species have increased over time, with a total of 35 non-native species having become established, while 3 taxa and 18 native species are now extirpated. Although changes in diversity have been studied extensively in a taxonomic framework in many systems, taxonomic diversity may not necessarily coincide with changes in functional diversity, and it has become increasingly important to understand these functional diversity changes in relation to the introduction and establishment of non-native species. Through understanding the role trait composition plays in the establishment of non-native species and extirpation of native species, management efforts will be better informed and more effective. Furthermore, many studies are limited in the number of temporal replicates due to a lack of historical data. We analyze how functional diversity has changed in relation to the extirpations of native species and establishment of non-native species in each of the Great Lakes from 1870-2010 by decade. These analyses will elucidate changes in spatial and temporal patterns of diversity over time, allowing for an examination of the drivers and implications of these changes.

*Does lure colour influence catch per unit effort and hooking injury in Largemouth Bass?*

Andrew. D. Moraga, **Alexander D.M. Wilson**, Steven J. Cooke; Fish Ecology and Conservation Physiology Laboratory, Institute of Environmental Science, Carleton University, Ottawa, Canada.

The contemporary tackle box is packed with lures that cover the full spectrum of colours with the assumption that colour influences fishing success. Yet, there is little evidence-based research that identifies how lure colour might influence capture rates. Moreover, while much is known about the factors that influence hooking injury or depth (which is a good predictor of mortality in released fish), to our knowledge no studies have examined if such factors are influenced by lure colour in fishes. Here we tested the effects of lure colour on catch-per-unit-effort (CPUE) and hooking injury of Largemouth Bass, *Micropterus salmoides*. Artificial 12.7 cm soft-plastic worms in six colours, blue (bream), black (leech), red (cigar), yellow (wasp), orange (sherbert), and white (pearl white), were individually fished for 20-min intervals. Lures were rotated such that all options were fished multiple times per day. Data analysis revealed that CPUE was similar across lure colours. Similarly, length-corrected hooking depth and anatomical hooking location were not influenced by lure colour. Our study reveals that while different lure colours might capture the imagination and wallet of the angler, they do not influence CPUE or hooking injury in bass.



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## Oral Presentation Abstracts

**Keynote Speaker:**

*America's Experiment with Voluntary Landscape Scale Aquatic Habitat Protection and Rehabilitation: Some thoughts about the first 10 years of the National Fish Habitat Partnership (NFHP)*

**Gary E. Whelan;** Program Manager and NFHP Science and Data Committee Co-Chair, Michigan Department of Natural Resources – Fisheries Division, P.O. Box 30446 Lansing, MI 48909, (517) 284-5840 ([whelang@michigan.gov](mailto:whelang@michigan.gov))

The National Fish Habitat Partnership (NFHP) has now been in existence for over 10 years in the United States and there are a number of lessons to be learned from this unique voluntary effort to bring emphasis and resources to aquatic habitat. NFHP was first envisioned during the period from 2001-2004 by individuals and groups associated with the Association of Fish and Wildlife Agencies. The initial plan, since revised, was written from 2004 to 2006 and approved in 2006 then updated in 2012. The mission of the National Fish Habitat Action Plan is to protect, restore and enhance the nation's fish and aquatic communities through partnerships that foster fish habitat conservation and improve the quality of life for the American people. The effort has been successful in: 1) Establishing a National Board of 22 key partners from states to federal to NGOs; 2) Establishing 19 Fish Habitat Partnerships (FHPs) from AK to HI to CA to FL to ME that are strong conservation communities in key species, for focused habitats, and areas that will last beyond NFHP; 3) Provided resources totaling \$56 million (US) that have used to conduct 417 projects in 46 states on 27,000 acres of lake, reservoir and estuary habitat and 1,560 river miles, in part based on national and partnership assessment efforts and returning an estimated 18:1 on investment; 5) Having federal and state agencies align habitat efforts and programs with NFHP; and 6) Generating a groundbreaking national aquatic habitat assessment that was completed in 2010 and will be updated every 5 years that will ultimately be a key decision support

mechanism for planning. The effort has not: 1) Galvanized a broad public awareness of the condition of aquatic habitat; 2) Inspired the passage of federal supporting legislation, creating issues between the Board and some of its partners; and 3) Created vast new resources for habitat protection and rehabilitation. NFHP struggles institutionally with the operation of the Board, succession of leadership, the relationship between NFHP and the key federal agencies, and the relationship between the Board and the FHPs. All of these are typical growing pains of new movements as they go beyond the initial excitement period and in spite of these issues, NFHP has made a noticeable difference in aquatic habitat in the U.S.

**Friday, February 27, 9:20 am**

*Fisheries and Oceans Canada's early detection surveillance program*

**David Marson**; Fisheries and Oceans Canada

Fisheries and Oceans Canada's Asian Carp Program has been created in response to the threat of invasion by Asian carps in the Canadian waters of the Great Lakes. To address the threat of Asian carps, Fisheries and Oceans has developed an early detection surveillance program. Early detection sampling techniques combine both traditional sampling gears, as well as environmental DNA sampling. A variety of traditional gears are being incorporated into the surveillance program and, for consistency, many of the deployment techniques have been coordinated with the current Asian carp sampling practices by US state and federal agencies. This presentation will highlight the steps taken in the development and delivery of Fisheries and Ocean's Asian Carp Program, from early detection site selection, to sampling gear and techniques used to target Asian carps.

**Friday, February 27, 9:40 am**

*Investigating the influence of land use and water quality on the production of algae along the shoreline of Lake Huron*

**Samantha Stefanoff\***, Todd Howell, and Sapna Sharma; York University

In recent years, there have been observed increases in the occurrence of shoreline fouling by algae in the southeast region of Lake Huron. These events have been attributed to changes in surrounding land use and lake water chemistry. This study aims to investigate the relative influence of land use, water chemistry, and spatial scale on shoreline productivity levels in Lake Huron. We used water chemistry data collected by the Ontario Ministry of the Environment at 46 sites for the Inverhuron region, and 47 sites for the Point Clark region of south-eastern Lake Huron. Land use classification data was collected at the watershed, remnant watershed, and shoreline level for these regions by ASL Environmental Sciences Inc. We developed linear models and used a variation partitioning framework to quantify the amount of variation in chlorophyll a levels, a measure of primary productivity, explained by land use, water quality and spatial variables. Preliminary analyses suggest that land use and water quality may be

contributing to primary productivity levels along the shoreline of Lake Huron, with nutrient levels explaining the most variation in productivity. A total of 61% of variation in primary productivity was explained by land use, water quality, and spatial variables at the Inverhuron study sites, with 28% of the total variation being explained by water quality uniquely. At the Point Clark study sites, 73% of the variation in primary productivity was explained by land use, water quality and spatial variables, with 63% being explained by water quality uniquely. These results provide an insight into what factors may be contributing to increases in productivity levels, but further analysis is needed to spatially examine changes in productivity levels along the shoreline of Lake Huron.

**Friday, February 27, 10:50 am**

*Panic at the Cisco: Predicting the Effects of Climate Change on Cisco Distributions in Ontario*

**Chen, M.\*** and S. Sharma; York University

Increasing lake water temperatures in response to climate change is expected to alter the distribution, thermal habitat, and growth of many aquatic organisms, including an ecologically and economically important coldwater fish species, cisco (*Coregonus artedii*). Our project examines the effects of climate change on the distribution of cisco populations in Ontario. Using a historical dataset of 9885 Ontario inland lakes surveyed between 1957-1986 and a contemporary dataset of 722 lakes sampled between 2008-2012, we will identify important environmental characteristics, such as lake morphology, lake chemistry and presence of predators and prey on cisco occurrence in Ontario. Subsequently, we will predict future cisco occurrence across Ontario for the years 2050 and 2070 by incorporating future climate change scenarios from 19 general circulation models and four greenhouse gas scenarios into our best predictive model of cisco occurrence. Using a logistic regression model, we determined that cisco prefer larger, deeper lakes, in cooler regions of Ontario. Warming air temperatures corresponded to a decline of cisco occurrence ranging from 8-37% ( $\bar{x} = 20\%$ ) by 2050 and 7-47% ( $\bar{x} = 26\%$ ) by 2070. Under 126 future climate scenarios, cisco populations were predicted to experience a southern range contraction by 388 km in Ontario. The loss of these forage prey species has consequent impacts on the growth of top predators such as lake trout. Through understanding the main drivers that control cisco populations and how future climate changes may impact them, we may further improve fisheries management decisions before cisco become extirpated in Ontario lakes.

**Friday, February 27, 11:10 am**

*Lampricide Impairs Olfaction in Young-Of-The-Year Lake Sturgeon (Acipenser Fulvescens)*

**Kathrine Sakamoto<sup>1\*</sup>**, William A. Dew<sup>2</sup>, Stephen J. Hecnar<sup>1</sup>, Gregory G. Pyle<sup>1,3</sup>; <sup>1</sup>Dept. of Biology, Lakehead University, 955 Oliver Road, Thunder Bay, ON, P7B 5E1 ([ksakamot@lakeheadu.ca](mailto:ksakamot@lakeheadu.ca)); <sup>2</sup>University of Brandon, 270-18th Street, Brandon, MB, R7A 6A9; <sup>3</sup>University of Lethbridge, 4401 University Drive, Lethbridge, AB, T1K 3M4.

Fish that feed or travel in low light conditions particularly rely on their chemical senses, such as olfaction, for survival. Exposure to toxicants at concentrations lower than those causing mortality can have detrimental effects on olfactory senses. Here we found the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) caused a reduced olfactory response to L-alanine, taurocholic acid and a food cue, reduced attraction to the scent of food and reduced consumption of food in young-of-the-year (YOY) Lake Sturgeon. Fish were able to detect the scent of TFM, but did not significantly avoid it, which may expose fish to the full toxic effects. These results have negative implications for YOY Lake Sturgeon that survive TFM treatments.

**Friday, February 27, 11:30 am**

*Distribution and Life History Observations of River Darter (Percina Shumardi) in Historical and New Locations throughout Northwestern Ontario.*

**Gardner\*, W.M.** and T.C. Pratt; Fisheries and Oceans Canada

River Darter (*Percina shumardi*) is a native, yet cryptic species in Canada that has been collected haphazardly throughout northwestern Ontario since the 1930's. In 2013 we sampled the Rainy River in northwestern Ontario using several gear types and in 2014 we used a Herzog-Armadillo Trawl to sample 10 historical and 5 new locations throughout northwestern Ontario. The Rainy River appears to support a robust population of River Darter. We also found River Darter in all of the historical and new locations. In all locations stomachs were examined to discern major diet items. In the Rainy River stomachs were also examined to determine the prevalence of *Bythotrephes* sp., a newly invaded zooplankton in the system. Generally diet in River Darter consisted of Tricoptera and Diptera. Ephemeroptera and Odonata were found in fewer guts. Age information of the River Darters collected was similar to that found in other areas of their range. Ages ranged from 1 to 4 years and were consistent with ages reported in the literature.

**Friday, February 27, 11:10 am**

*Hydrodynamic Characteristics of Critical Walleye and Lake Sturgeon Spawning Habitat Below a Hydroelectric Dam in the Rainy River, Ontario*

**Muirhead\*, J.**<sup>1</sup>, Smith, A.<sup>2</sup>, Annable, B.<sup>1</sup>, Power, M.<sup>2</sup>, & Smokorowski, K.<sup>3</sup>; <sup>1</sup>Department of Civil & Environmental Engineering, University of Waterloo, 200 University Ave W, Waterloo, ON ([j3muirhe@uwaterloo.ca](mailto:j3muirhe@uwaterloo.ca)); <sup>2</sup>Department of Biology, University of Waterloo; <sup>3</sup>DFO Great Lakes Laboratory for Fisheries and Aquatic Sciences

River regulation for the purposes of flood control and hydropower generation causes major deviations in the flow regime and resulting river hydraulics. Success and stability of river ecosystems are often dependent on specific hydraulic conditions occurring on certain spatial and temporal scales. During April - July of 2012 and 2013, Walleye and Lake Sturgeon spawning surveys were completed in parallel with spatial

and temporal velocity profile sampling using Acoustic Doppler Current Profiler (ADCP) technology on a 21 km reach of the Rainy River below the International Falls Dam in northwestern Ontario/northern Minnesota. 83 hydrodynamic metrics were computed from ADCP velocity profiles obtained at 7 - 10 discrete discharges over the range in seasonal flows (100 - 900 m<sup>3</sup>/s), at 47 cross section locations. Metrics did not trend significantly with discharge. Cross sections were categorized according to spawning utilization (high, moderate, low). Statistical analysis isolated metrics which demonstrated significant differences in temporal means and variances between locations of high, moderate, and low spawning utilization and highlighted the importance of spatial habitat heterogeneity in multi-attribute spawning site selection by Walleye and Lake Sturgeon. The identified eco-hydraulic linkages will be applied to optimize spawning/nursery habitat for these species on the Rainy River.

**Friday, February 27, 2:00 pm**

*Do angling technique and lure type selectively target fishes based on their behavioural type?*

**Jacob W. Brownscombe\***, Alexander D.M. Wilson, Brittany Sullivan, Sofia M.R. Jain-Schlaepfer, Steven J. Cooke; Fish Ecology and Conservation Physiology Laboratory, Dept. of Biology and Institute of Environmental Science, Carleton University, 1125 Colonel By Dr., Ottawa, ON K1S 5B6

Recently, there has been growing recognition that fish harvesting practices can have dramatic impacts on the phenotypic distributions and diversity of natural populations through a phenomenon known as fisheries-induced evolution. Here we tested whether or not two common recreational angling techniques (active crank baits versus passive soft plastics) differentially target wild Largemouth Bass (*Micropterus salmoides*) and Rock Bass (*Ambloplites rupestris*) based on their behavioural type. Individuals were first angled in the wild and then brought back to the laboratory and tested for individual-level differences in personality (refuge emergence, flight-initiation-distance, activity and latency-to-recapture with a net) in an in-lake experimental arena. For the first time we found that different recreational angling techniques appear to selectively target these species based on their behavioural type (as characterized by refuge emergence, a standard measure of boldness in fishes). We also observed that body size was independently a significant predictor of personality in both species, though this varied between traits and species. Our results broadly suggest a context-dependency for vulnerability to capture relative to personality in these species. Ascertaining the selective pressures angling practices exert on natural populations is an important area of fisheries research with significant implications for ecology, evolution and management.

**Saturday, February 28, 8:30 am**

*Rekindling the Association with the Declining American Eel through Stewardship*

**Colleen Burliuk\*** and John M. Casselman; Queen's University, Department of Biology, Kingston, Ontario, Canada K7L 3N6; phone 613-533-6000 ext. 75371  
([colleen.burliuk@queensu.ca](mailto:colleen.burliuk@queensu.ca))

American eels (*Anguilla rostrata*) have long been revered and relied upon as a dependable food resource by Aboriginal peoples of the St. Lawrence River system. This valued association is rapidly being lost to everyone because of the dramatic decline of the species caused by many factors including the unique migratory life cycle of eels. Stocking, formal declarations, and stewardship are all important techniques in rekindling this association. Stocking ensures species presence and maintains awareness, declarations formally announce concern and build profile, and outreach and stewardship increases familiarity with the species by engaging people. Stewardship has been initiated through school outreach that involves students and engages the young. These programs have been initiated through the Society of Conservation Biology in schools in the Kingston area by using activities and games developed specifically for the project (e.g., Eel Jeopardy, Eel Ladders and Chutes). We also emphasize the use of eel biology, such as ongoing studies of winter habitat and the communal wintering "balling" in soft bottom silt, to inform students of the unique behaviours and mysteries of eels. Instilling knowledge, respect, and passion for eels will inspire all people to become better stewards of the species and to encourage their recovery and rehabilitation.

**Saturday, February 28, 08:50 am**

*Temperature effects on the resting metabolic rates of early developmental Brook Trout*

**Catharine Cook;** Trent University

Cold adapted ectotherms such as Brook Trout (*Salvelinus fontinalis*) are at risk of extinction as temperatures rise with global warming. Early developmental stages are at the highest risk as these stages are most sensitive to changes in their environment. This study looks at the routine metabolic rates (RMR) of Brook Trout eggs, alevin and young fry reared and tested in temperatures within their normal range and at their upper thermal tolerance. Oxygen consumption was used as the measurement for RMR. Wild fish from different ancestries, populations and families were used to determine at which level brook trout were affected by changes in temperature. AIC analysis was used to find the best models accounting for the variation in RMR data. It was determined that family level and temperature variables were most important for predicting RMR. At this point it appears that the genetic variability found in each of the ancestries and therefore populations within is paramount to allow for acclimation to increased temperatures and future survival of these cold adapted ectotherms.

**Saturday, February 28, 09:10 am**

*Research Diving Presentation.*

**Dr. Nigel Waltho;** Carleton University

Across most of Canada, research scientists are free to use sport scuba diving as a means to observe, set instrumentation, and to collect data from aquatic and marine systems. To regulate a minimal level of diving competency academic and government institutions have derived a set of guidelines managed by the Canadian Association for Underwater Sciences. However, Ontario Regulations 629.94 does not recognize these guidelines, and instead stipulate that any scientific diving in Ontario must conform to the Canadian Occupational Diving Standards Z275.4-12 – in short, Commercial Diving practices. Until recently, the only way to meet these standards in Ontario was to take a 1 to 2 year commercial diving course. As a consequence, research diving in Ontario has either not been done, or if it were the research was illegal or performed by commercial divers who have little to no training in the actual research. To mitigate this problem, that is, with the goals of getting the eyes of the scientific researcher into the water (legally) a consortium of Ontario Universities (Carleton, Guelph, and Queen's) have successfully designed a 3-week Restricted Commercial Diving course to be run once a year at the Queen's Biological Research Station, Lake Opinicon. This course is open to all Ontario academic institutions and researchers interested in research diving in Ontario.

**Saturday, February 28, 09:30 pm**

*Impacts of dredging on fish species at risk in Lake St. Clair, Ontario*

**J. Barnucz**\*<sup>1</sup>, N.E. Mandrak<sup>2</sup>, L.D. Bouvier<sup>1</sup>, R. Gaspardy<sup>1</sup> and D.A. Price<sup>1</sup>; <sup>1</sup>Great Lakes Laboratory for Fisheries and Aquatic Sciences, Fisheries and Oceans Canada, P.O. Box 5050, 867 Lakeshore Road, Burlington, Ontario, L7R 4A6; <sup>2</sup>Department of Biological Sciences, University of Toronto Scarborough, 1265 Military Trail, Toronto, Ontario, M1C1A4

To evaluate the impacts of maintenance dredging Fisheries and Oceans Canada (DFO) Science sampled impact sites (dredged, dredgeate) and reference sites. Impact sites were locations experiencing periodic maintenance dredging and dredgeate disposal. Reference sites were nearby locations of similar depth and substrate with no known prior disturbance from maintenance dredging activities. DFO Science conducted a repeated trawling survey to compare the fish community and fish abundance between impacted and reference sites. The impact sites were paired with nearby reference sites with similar depths and substrate type. No fish species at risk were captured at any impact sites (dredged or dredgeate locations). One Eastern Sand Darter (*Ammocrypta pellucida*) was captured at one reference location. Catch per Unit Effort (CUE) was compared between impact and reference treatments for both dredged and dredgeate locations. No significant difference in CUE between the dredged and reference sites ( $p=0.6414$ ), and between dredgeate and reference sites was observed ( $p=0.9156$ ).

Seasonal comparisons found a significant difference in CUE between spring and fall ( $p=0.0026$ ) as well as spring and summer ( $p=0.0102$ ). Further, no significant difference in CUE was observed between trawl repeated trawls (three passes) across all treatments ( $p=0.4831$ ). These results suggest that the abundance of fish species at risk in Lake St. Clair is likely very low. As such, the direct impact of maintenance dredging on these fishes is expected to be low. Fish abundance within sites was lowest during the spring and fall sampling periods. This result supports the continued use of fisheries timing windows to mitigate impacts of maintenance dredging on the local fish community. Depletion of fishes by repeated trawling within each site was not significant across all treatments. This result does not support the use of repeated trawling as a fish removal technique. Future research on maintenance dredging activities using a before/after design to better understand the impacts on fishes and their associated habitats is recommended. It is also recommended that maintenance dredging activities including timing of activities, disposal locations and monitoring be better communicated between stakeholders, as this communication will aid in future assessment of maintenance dredging activities.

**Saturday, February 28, 09:50 pm**

*Phenotypic divergence of early life history traits among introduced Great Lakes Chinook Salmon populations*

**Michael Thorn;** Western University

The ELH stage of salmonid development is highly vulnerable to environmental change and there is growing concern about how salmon populations will respond to increasing environmental disturbance. We investigated the adaptive potential of ELH traits by studying the patterns of phenotypic divergence in ELH traits among introduced Great Lakes Chinook Salmon (*Oncorhynchus tshawytscha*) populations. Chinook Salmon embryos from the Pine (Lake Huron), Sydenham (Lake Huron), and Credit Rivers (Lake Ontario) were reared in a common garden hatchery environment at three separate temperatures (6, 10, 15°C). A variety of ELH traits were measured throughout development including stage specific size and growth. There were differences in almost all ELH traits among populations and these differences varied by temperature. In addition, we found that egg size was important in mediating the response of ELH traits among the different temperature regimes. Phenotypic divergence in ELH traits among Great Lakes Chinook salmon populations has occurred in ~12 generations indicating that salmon have the potential to adaptively respond to new environmental conditions on ecological timescales.

**Saturday, February 28, 10:10 pm**

*Integrated approaches for evaluating the spatial ecology and movement behaviours of migratory giant Amazonian catfish, Dourada (Brachyplatystoma rousseauxii)*

**Taylor Ward\*** (Carleton University), Lisiane Hahn (Neotropical Consulting), Vivian Nguyen (Carleton University), Michael Power (University of Waterloo), Pricscila Lopes

(Universidade Federal do Rio Grande do Norte) and Steven Cooke (Carleton University).

The recent proliferation of large dams within the Amazon River basin poses significant threats to the connectivity of aquatic riverine habitats, particularly for species that are migratory. Here, current research on a giant migratory catfish (dourada, *Brachyplatystoma rousseauxii*) in the Madeira River will be used to illustrate the complex social, economic, and ecological systems associated with fish passage in the Amazon basin. Dourada are found throughout the Amazon basin, spawning as adults in the Andean foothills and passively drifting as larvae to the Amazon delta, before undergoing a return migration that can be thousands of kilometres long. Ongoing research takes an integrative approach in studying the movement ecology of this cryptic species, including radio telemetry of wild fish, tri-axial accelerometry of captive fish, otolith microchemistry, and Local Ecological Knowledge. Using these tools, the biotic and abiotic constraints on migratory behaviour and swimming performance will be evaluated to enhance fish passage at the Santo Antonio Dam, near Porto Velho, Brazil. Given the cultural and economic importance of the dourada subsistence fishery, improving fishway performance and increasing the biological knowledge of this species is imperative for the conservation and management of this species. This presentation will highlight the challenges associated with working in a large tropical river system, as well as discuss the virtues of using interdisciplinary approaches in fisheries research.

**Saturday, February 28, 10:30 am**

*Silver Shiner: Habitat Descriptions and Distribution in Ontario*

**Gaspardy, R.\***, Barnucz, J., Bouvier, L., Glass, W., and Mandrak, N.; Fisheries and Oceans Canada, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Bayfield Institute, 867 Lakeshore Road, Burlington, ON, L7R 4A6 ([Robin.Gaspardy@dfompo.gc.ca](mailto:Robin.Gaspardy@dfompo.gc.ca))

The Silver Shiner (*Notropis photogenis*) is a small riverine fish currently listed as Special Concern by the Canadian Species at Risk Act (SARA) under Schedule 3. In 2011, COSEWIC recommended that the status of this species be increased to Threatened due to its limited population and susceptibility to habitat loss and degradation. Little is known regarding the habitat preferences of this species and therefore risk of extirpation and critical habitat estimations are based on general habitat use assumptions. In 2011 extensive sampling was conducted by Fisheries and Oceans Canada in four watersheds in the Great Lakes basin from which Silver Shiner are known: Sixteen Mile Creek, Bronte Creek, Grand River and Thames River. Fishes were collected using a seine net and a repeat sampling method and fine-scale habitat assessments were conducted at each site. An electivity index was used to determine habitat preference for the following habitat parameters: stream depth, water velocity, temperature, dominant substrate type, and stream width.

**Saturday, February 28, 11:10 am**

*Predicting the effects of climate change on Walleye and Smallmouth Bass distributions in Ontario inland lakes: are Walleye in a pickle-rel?*

**Van Zuiden, T.\***, Stefanoff, S. and S. Sharma; Department of Biology, York University, M3J 13P, Lumbers Science Building Room 217 PO Box GA2300, Toronto, ON, Canada ([thomas.vanzuiden@gmail.com](mailto:thomas.vanzuiden@gmail.com))

Climate change is expected to alter freshwater fish distributions by causing range shifts, contractions or expansions. This can lead to novel biotic interactions, changes in food web dynamics, and potential extirpations of certain fish populations. The objective of our study is to elucidate the effects of climate change on Walleye (*Sander vitreus*) and Smallmouth Bass (*Micropterus dolomieu*) populations in Ontario inland lakes. Lake and fish data were obtained from the OMNR's aquatic habitat inventory survey and broad-scale monitoring program for 9736 lakes. Logistic regression models suggest that Walleye prefer large lakes with low water-clarity, lower air temperatures, and high precipitation. We predicted that Walleye populations will decline by an average of 19% by 2050, and 24% by 2070. We also found that these declines occur in Ontario's southern lakes, and that Walleye are expected to expand into more northern regions of Ontario. Smallmouth Bass prefer larger, warmer lakes, with high water clarity and low precipitation and are expected to expand their range by 258% in 2050 and 305% in 2070. We will next consider how Walleye and Smallmouth Bass may interact under future climate scenarios.

**Saturday, February 28, 11:30 am**

*Littoral Fish Community Changes in Southeastern Ontario*

**Finigan, P.\***, Mandrak, N. and B. Tufts; Department of Biology, Queen's University, Kingston, Ont., Canada K7L 3N6 ([finiganp@gmail.com](mailto:finiganp@gmail.com))

Canada has nearly 210 freshwater fish species. Of these species, 30% of them have been assessed to be Extirpated, Endangered, Threatened or Special Concern. With rapid loss of fish diversity, it is crucial to monitor and assess our current fish distributions. Ontario has one-quarter of a million lakes and has the largest fish diversity of any province: 128 fish species, in 24 families including 17 introduced species with established populations. Anthropogenic factors associated with increases in human populations contribute to species decline from habitat loss, habitat degradation, alien species introductions and climate change. Because Ontario is the most populated province in Canada, it is expected to be a hot spot for community change and biodiversity loss in fishes. The aim of this study was to describe fish community changes over time using assemblage data from historical and contemporary periods. To do so, we compiled historical fish assemblage data from 22 lakes. We then repeated the historical methods to create a contemporary data set. With these two data sets we can make a direct comparison of fish community changes across a large spatial scale over a large time period. Using a multivariate approach, results show a strong shift from

cyprinid-dominated to centrarchid-dominated communities between time periods. Although it is suspected that there are many factors contributing to the community change, we discuss why increasing temperatures could be a major driver.



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