AMERICAN FISHERIES SOCIETY

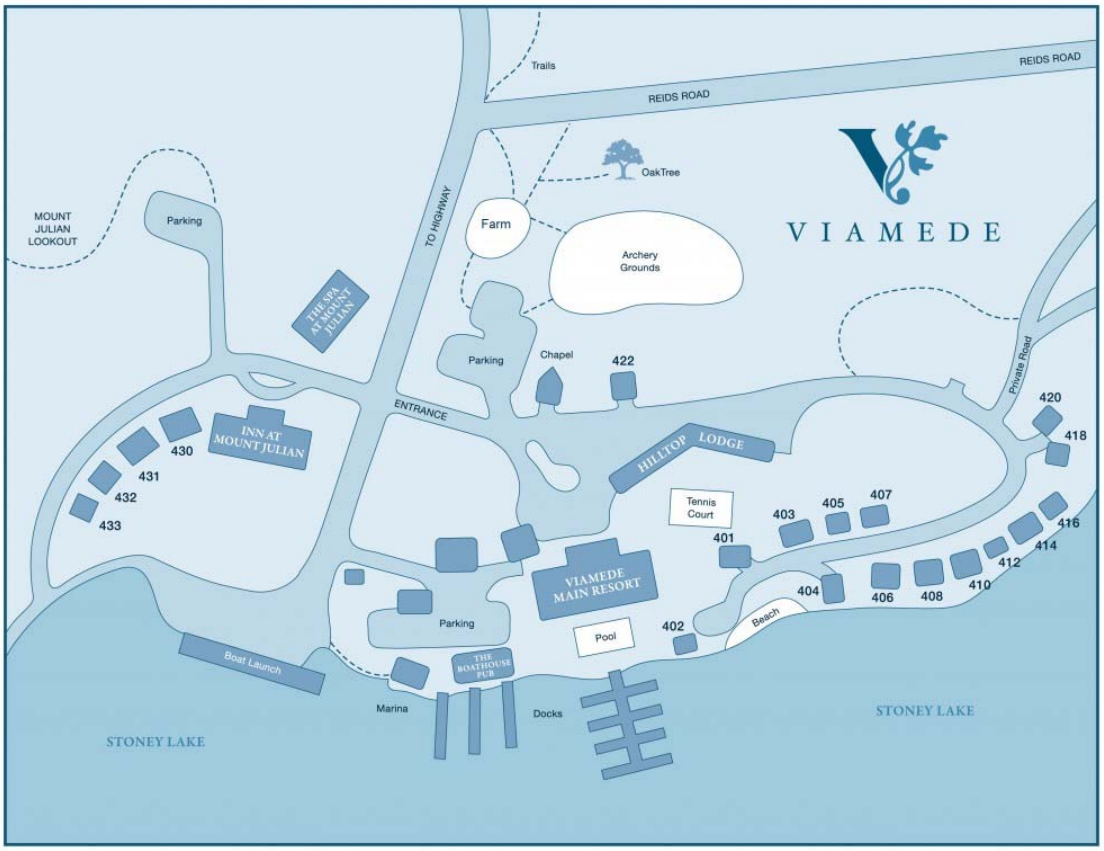
ONTARIO CHAPTER

ANNUAL GENERAL MEETING

March 1st – 3rd, 2012
Viamede, Woodview, ON

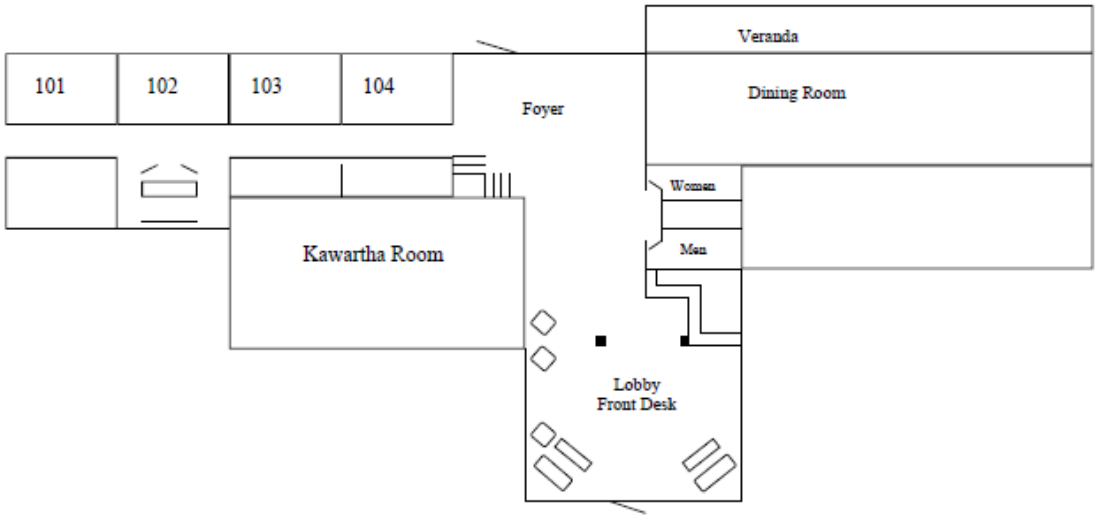
"Science and the Tools for Aquatic Resource Management"

Student Participation, the E.J. Crossman Award, and the OBFN Award have been made possible through the generous support of our sponsors. Please support them.



222	220	218	216	214	212	210	206	204	202
217	215	213	211					203	201

Second Floor Guest Rooms



AMERICAN FISHERIES SOCIETY
ONTARIO CHAPTER

ANNUAL GENERAL MEETING
March 1st – 3rd, 2012
Viamede, Woodview, ON

"Science and the Tools for Aquatic Resource Management"

Thursday March 1st

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

8:00-10:00 **Student BBQ (Cottage 404)**

Friday March 2nd

7:30-8:30 **BREAKFAST (Foyer)**

08:30 **GREETING AND CONFERENCE OUTLINE (Dining Room)**

08:40 ***Keynote Talk:*** *The Science Framework for Broad-scale Monitoring in Fisheries Management Zone 17.* ***Mike Rawson****

Session 1: Evaluating American Eel Stocking Success (Dining Room)

09:10 ***Talk 1:*** *Distribution and characteristics of stocked American eel in Lake Ontario tributaries.* **Sarah E. Hogg***, and Scott M. Reid

09:30 ***Talk 2:*** *Distribution and habitat associations in stocked American eels, Anguilla rostrata, in Lake Ontario tributaries, Moira and Napanee River.* **Megan Lloyst***, Scott Reid, Thomas Pratt, and Michael G. Fox

09:50 ***Talk 3:*** *A comparison of the sex ratio and growth of stocked and wild American eels (Anguilla rostrata) in Lake Ontario and the Upper St. Lawrence River*. **Joshua Stacey***, Thomas C. Pratt, and Michael G. Fox

10:10 **COFFEE, TRADE SHOW, POSTER SESSION (Foyer, Veranda)**

Session 2: Science and Fisheries Management 1 (Dining Room)

10:30 ***Talk 4:*** *Applications and limitations of the effective population size concept for fisheries management.* **Mohammed Alshamlih***, and Chris C. Wilson

10:50 ***Talk 5:*** *Comparison of a single and multi-gear approach to generating index of biotic integrity scores for the Detroit River area of concern*. **Jason Barnucz***, Robin Gaspardy, Mike Parna, and Nicholas E. Mandrak

11:10 ***Talk 6:*** *Movement and thermal ecology of adult walleye from the Tittabawassee and Maumee Rivers.* **William M. Bowden***, Karen Murchie, Steven J. Cooke, John M. Dettmers, Christopher Holbrook, and Christopher S. Vandergoot

11:30 ***Talk 7:*** *Contributions and comparative fitness of hatchery-stocked walleye and wild recruits in Black Bay, Lake Superior*. **Shawn R. Garner***, Steven M. Bobrowicz, and Chris C. Wilson

11:50 ***Talk 8:*** *Highland Creek fish habitat model: a prototype for assessing the habitat benefits of restoration projects*. **Brian Hindley*** and William Snodgrass

12:10 **LUNCH (Dining Room), TRADE SHOW (Veranda) & POSTER SESSION**

Session 3: Science and Fisheries Management 2

1:00 ***Talk 9:*** *A comparison of fish spawning restoration efforts in the Detroit River.* Ellen George, David Bennion, James Boase, Emily Bouckaert, Jaquie Craig, Rich Drouin, **Stacey Ireland***, Greg Kennedy, Bruce Manny, Edward Roseman, Jenny Sutherland, and Patricia Thompson

1:20 ***Talk 10:*** *Northern pike bycatch in an inland commercial trap net fishery: effects of water temperature and net tending frequency on injury, physiology, and survival*. Alison H. Colotelo, **Graham D. Raby*,** Caleb T. Hasler, Tim J. Haxton, Karen E. Smokorowski, Gabriel Blouin-Demers, and Steven J. Cooke

1:50 ***Talk 11:*** *Effect of food abundance on aggressiveness and territory size of juvenile rainbow trout, Oncorhynchus mykiss* **Asra Toobaie***, and James W.A. Grant

2:10 ***Talk 12:*** *Consequences of incidental capture of freshwater turtles in commercial fisheries.* **Lauren J. Stoot***, Nicholas A. Cairns, Steven J. Cooke, and Gabriel Blouin-Demers

2:30 ***Talk 13:*** *So why do we still have state fish hatcheries in Michigan in the 21st century: an evaluation of the role of and interplay between fish production and management.* **Gary E. Whelan***

2:50 **COFFEE, TRADE SHOW & POSTER SESSION (Foyer, Veranda)**

3:05 *Identification of possible topics for workshops at future conferences.* **Dean Fitzgerald***, **Sylvia D'Amelio***, and Jack Imhof

3:35-5:00 **ANNUAL BUSINESS MEETING (Dining Room)**

3:35 or 5:00-6:30 **TRADE SHOW, POSTER SESSION, ICE FISHING**

6:30-10:00 **SUPPER AND SOCIAL (Dining Room)**

Saturday March 5th

7:30-8:30 **BREAKFAST (Foyer)**

Session 4: Introduced Species (Dining Room)

08:30 ***Talk 14:*** *The effect of dreissenid mussels on the strength of density dependent growth and recruitment of lake whitefish in Lake Huron.* **Jenilee Gobin***, Erin S. Dunlop, and Michael G. Fox

08:50 ***Talk 15:*** *Nine years of round goby research in the Trent-Severn Waterway: what we have learned from this biological invasion.* **Lee F.G. Gutowsky***, Jacob W. Brownscombe, Graham D. Raby, and Michael G. Fox

09:10 ***Talk 16:*** *The behavioural basis of trapping an invasive species: lessons learned from the sea lamprey.* **Andrew M. Rous***, and Rob L. McLaughlin

09:30 ***Talk 17:*** *Molecular tools for the detection of invasive snakeheads in North America.* **Natasha R. Serrao***, Dirk Steinke, and Robert H. Hanner

9:50 ***Talk 18:*** *Fanning behaviour and communication in the round goby (Neogobius melanostomus), an invasive fish.* **Kristina Wantola***, and Lynda Corkum

10:10 **COFFEE & POSTER SESSION (Foyer)**

Session 5: Ecology and Evolution of Fishes (Dining room)

10:30 ***Talk 19:*** *Habitat occupancy by lake whitefish (Coregonus clupeaformis) includes an ecotone in the profundal zone of two Canadian Shield Lakes.* **Adam Challice***, and Mark S. Ridgway

10:50 ***Talk 20:*** *Redshift: the enigma of the evolution of erythrocytes in fish.* **Norm Quinn***

11:10 ***Talk 21:*** *Risk taking, not foraging tactics form the basis for individual differences in propensity to disperse in young brook charr*. **Alan H. Edelsparre*,** Rob McLaughlin, and M A. Rodríguez

11:30 ***Talk 22:*** *Novel molecular phylogeny of the Lepisosteidae and identification of specimens of unknown origin*. **William Glass***, Ryan Walter, Daniel Heath, Nicholas Mandrak, and Lynda Corkum

11:50 **PRESENTATION OF STUDENT AWARDS AND CONFERENCE WRAP (Dining Room)**

12:15 **LUNCH (Dining Room)**

AMERICAN FISHERIES SOCIETY
ONTARIO CHAPTER

ANNUAL GENERAL MEETING
March 1st – 3rd, 2012
Viamede, Woodview, ON

"Science and the Tools for Aquatic Resource Management"

Poster Presentation Abstracts

Fish habitat assessment and restoration strategies for the Huron-Erie corridor

S. Ireland, D. Bennion (U.S. Geological Survey), J. Boase (U.S. Fish and Wildlife Service), E. Bouckaert (U.S. Geological Survey; Michigan Technological University), **J. Craig ***(U.S. Geological Survey), J. Francis (Michigan Department of Natural Resources), E. George, G. Kennedy, B. Manny, M. McLean, E. Roseman, J. Sutherland, and P. Thompson (U.S. Geological Survey)

The international Huron-Erie Corridor includes southern Lake Huron, the St. Clair River, Lake St. Clair, the Detroit River, and western Lake Erie. Conflicting uses of HEC waters for waste disposal, water withdrawals, shoreline development, shipping, recreation, and fishing have resulted in a number of environmental changes to this system including loss and impairment of fish spawning and nursery habitat. As part of the HEC Initiative developed in 2004, a collaborative, science-based adaptive management approach was developed that allows flexibility to address natural resource issues in complex and ever-changing environments. Goals of the HEC initiative include: 1) Restore/improve the ecological function and resilience of the HEC ecosystem, 2) Maintain healthy, diverse, and productive aquatic ecosystems throughout the HEC that will in turn provide societal, economic, and environmental benefits to the Great Lakes region and throughout the U.S. and Canada. Activities of the HEC Initiative include: creation of two fish spawning reefs in the Detroit River and documentation of their use by native fishes including lake sturgeon, walleye, and lake whitefish; assessment of larval fish distribution and abundance in the Detroit River and western Lake Erie to explore connectivity between spawning and nursery areas; and identification of candidate sites for spawning habitat restoration in the St. Clair River.

Using stable isotopes to analyze dreissenid-induced changes in the feeding habits of Lake Whitefish in the Great Lakes

S. Fera* (Trent University), M. D. Rennie (Fisheries and Oceans Canada), and E. S. Dunlop (Ontario Ministry of Natural Resources)

The establishment of dreissenid mussels has contributed to the re-engineering of the Great Lakes ecosystem by altering trophic interactions and modifying food web dynamics. The invasion of dreissenid mussels (*Dreissena polymorpha* and *Dreissena bugensis*) in the Great Lakes is likely altering the availability of food sources to native Great Lakes species. The commercially important lake whitefish, in particular, have shown declines in growth in several locations, and recent research indicates dreissenid-driven ecosystem changes may be the cause. Coinciding with the establishment of dreissenids, the primary food source of lake whitefish, *Diporeia*, has declined, which may be causing lake whitefish to search for new prey sources. Initial research in an isolated population of lake whitefish in South Bay, Lake Huron, showed an increased dependence on nearshore food sources as a result. We analyzed $\partial^{13}C$ and $\partial^{15}N$ isotope ratios from archived lake whitefish scale samples collected in three Great Lakes locations (Lake Huron, Lake Ontario, and Lake Superior) to determine if there has been a wide-spread change in the depth at which whitefish feed following dreissenid establishment. Preliminary analysis shows increases in $\partial^{13}C$ and decreases in $\partial^{15}N$ in both Cape Rich (Lake Huron) and Ontario following dreissenid establishment, but no shift was observed in Lake Superior where dreissenids have not become established. The shifts in isotopic signatures in Huron and Ontario are indicative of a shift to nearshore food sources and a shallower depth distribution.

Estimating Population Density of Fish Species at Risk in Southern Ontario Wetlands

D. M. Marson*, J. Barnucz (Fisheries and Oceans Canada), S. M. Reid, J. Devlin (Ontario Ministry of Natural Resources), and N. E. Mandrak (Fisheries and Oceans Canada)

Management and recovery of aquatic species at risk requires reliable sampling methods to characterize species distribution and population size. In 2010, Fisheries and Oceans Canada conducted seining surveys of wetland habitats with the objectives of determining the geographic distribution of Pugnose Shiner (*Notropis anogenus*, Endangered), and developing population estimates of Pugnose Shiner and Lake Chubsucker (*Erimyzon sucetta*, Threatened). Using a block net, and a multi-pass removal technique, population density estimates were developed for Lake Chubsucker sampling sites in L Lake and Lyons Creek, as well as Pugnose Shiner sites in West Lake and the St. Lawrence River. The calculation of suitable density estimates required a decline in catches over successive passes (i.e., depletion sampling), but this condition was not met in the majority of sampling sites. Although density estimates were successfully developed for several sites, the seining protocol employed was generally not successful in consistently generating appropriate population estimates because sampling did not result in the decline of catches through successive passes. The lack of a decline in catches was attributed to low gear

efficiency, due to the sparse populations of target species, and habitat complexity. Results of this study highlight the continued challenges associated with sampling imperilled fishes in complex habitats.

Evaluating inter-annual and seasonal variation in fish assemblages of the Detroit River area of concern, 1990-2011

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

To assess changes in the fish assemblage related to restoration efforts in the Detroit River Area of Concern (AOC), fishes have been sampled intermittently between 1990 and 2011. In 2004, 2007, and 2011, Fisheries and Oceans Canada (DFO) sampled fish assemblages at six sites in the Detroit River AOC to examine the inter-annual and seasonal variation of fish assemblages based on the index of biotic integrity (IBI). Cumulative (pooled) IBI scores for all sites generally exhibited a decreasing trend from 25 in 1990 to 21 in 2011, while intra-annual variation was detected in IBI scores in 2004-2011.The decreasing trend in IBI scores may be the result of the IBI not being sensitive to changes resulting from the restoration efforts, the IBI based on incomplete assemblage data as a result of gear bias, or restoration efforts not having the intended consequences – these hypotheses need to be explored further. The seasonal variation indicates that time of sampling is an important consideration.

Biological effectiveness of an inexpensive nature-like fish bypass for passage of warmwater fish on a small Ontario stream

S. M. Steffensen*, J. D. Thiem, K.M. Stamplecoskie, C. Hatry (Carleton University), T.R. Binder (Great Lakes Fisheries Commission), N. Langlois-Anderson (South Nation Conservation Authority), and S. J. Cooke (Carleton University)

Nature-like fishways are growing in popularity for improving stream connectivity for fish in the vicinity of small dams. However, there have been few studies conducted to evaluate the effectiveness of these fishways, particularly in low-gradient warmwater streams with diverse fish communities. We evaluated a nature-like fishway that was installed to facilitate passage past at a low-head (1.45 m) dam on Indian Creek near Spencerville, in south-eastern Ontario. The 116 m fishway was constructed largely by volunteer labourers and was therefore inexpensive so the approach, if successful, has the potential to be adopted elsewhere. From April 1 to June 3, 2011, we used a passive integrated transponder (PIT) array to quantify attraction and passage efficiency for 394 PIT tagged warmwater fish, represented by seven species. Attraction efficiency for the three most common species, common shiner, creek chub, and white sucker, was 63.3%, 83.7%, and 65.6%, respectively and passage efficiencies was 5.1%, 38.4%, and 25%, respectively. Common shiner and white sucker were able to pass the fishway relatively quickly (mean of 1.2 ± 0.2 hrs and 4.3 ± 2.1 hrs respectively), however, they took considerably longer to locate the fishway entrance prior to passage (mean of 99.4 ± 13.8 hrs and 63.2 ± 23.0 hrs respectively). Creek chub were able to locate the fishway in less

time (mean 29.4 ± 7.0 hrs), however took longer to successfully pass (mean 19.4 ± 12.8 hrs). Most (>90%) activity and fishway passage was nocturnal for the three most common species. Manipulation of creek chub release locations was used to separate issues of attraction and passage and revealed that passage efficiency was highest (76.2%) for those released within the fishway (i.e., 10 m upstream of entrance), intermediate for those released at the entrance (42.1%), and lowest for those released 100m downstream (25%). Given modest attraction efficiency, poor passage efficiency, and evidence from the experimental release, we suggest modifications to improve attraction (placement of instream structures) and address an apparent passage challenge (shallow bedrock areas) in the lower reaches of the fishway. This multi-species fishway constructed by volunteers improved connectivity for stream fishes, but additional work is needed to fine-tune its configuration. Similar projects that engage stakeholders in nature-like fishway construction are a promising approach for the thousands of small dams that occur on low-gradient streams around the globe, but that those studies should incorporate a biological evaluation to ensure that attraction and passage efficiency are optimized.

The influence of fluctuating ramping rates on aquatic invertebrate feeding fish species of boreal rivers

K. Tuor* (Carleton University) and K. Smokorowski (Fisheries and Oceans Canada)

The response of aquatic organisms to flow regulation at hydro facilities has become a key issue for the development of sustainable management practices in regulated rivers intending to maintain biological integrity. In previous studies, unrestricted ramping rates have been found to have a negative effect on invertebrate communities and the length of the food web. The decrease in the length of the food web was found to be due to the significant decrease in the difference between macroinvertebrates and fish $\delta^{13}N$ signatures, equivalent to the loss of the one trophic level. A before-after-control-impact design was applied to determine the possible effects of ramping rate restrictions on the diet of small bodied fishes in a boreal river. Stomach content was analysed to order and abundance, diversity and taxa composition was measured to get an understanding of the alterations that occurred in the food web and how fish species diets may have changed to compensate for the shift in the invertebrate trophic level. It was found that unrestricted ramping rates were associated with an increase in invertebrate abundance within the stomach content. There was no affect on stomach contents from the change to unlimited ramping for both EPT abundance and species diversity, as both rivers followed a similar trend over time. A greater frequency of baseline and a lower frequency of predatory macroinvertebrates were found than expected within the altered river stomach contents after unrestricted ramping rates. This demonstrates that the diets of small bodied fish have changed to compensate for the alterations to the food web due to unrestricted ramping rates and climate effects, implying that ramping rates should be taken into consideration in the regulation of operating regimes on rivers. However, these results should be viewed with caution and further research is needed to understand the effect of climate on the food web.

AMERICAN FISHERIES SOCIETY
ONTARIO CHAPTER
ANNUAL GENERAL MEETING
March 1st – 3rd, 2012
Viamede, Woodview, ON

"Science and the Tools for Aquatic Resource Management"

Oral Presentation Abstracts

Friday, March 2nd, 8:40 am

The Science Framework for Broad-scale Monitoring in Fisheries Management Zone 17.

Mike Rawson* (Ontario Ministry of Natural Resources)

The Ministry of Natural Resources developed the Broad-scale Monitoring program to provide the information needed for landscape level management off Fisheries Management Zones (FMZ). The Broad-scale Monitoring program became operational in 2008. Survey work in Zone 17 has been completed and preliminary data summaries have been produced for the sample lake. A life history model for walleye has been developed that produces diagnostic bench marks that can be used in the management cycle.

Friday, March 2nd, 9:10 am

Distribution and characteristics of stocked American eel in Lake Ontario tributaries

Sarah E. Hogg*, and Scott M. Reid (Ontario Ministry of Natural Resources)

Dramatic declines in American Eel populations have resulted in its provincial designation as Endangered and the implementation of a variety of conservation measures. In Ontario, recovery actions have involved the experimental stocking of glass eels and elvers into the upper St. Lawrence River and Bay of Quinte. Dispersal of stocked eels throughout Lake Ontario tributaries was assessed through backpack electrofishing surveys during 2010

and 2011. Barriers to upstream migration of eels were classified across each watershed. Results indicate that stocked eels were able to access large extents of Millhaven Creek, and the Napanee and Salmon rivers. Dams along the lower near reaches severely restricted upstream distribution along the Trent and Moira rivers. Generalized additive modelling (GAM) suggest that the post-stocking distribution of eel was influenced by the distance upstream, number of impassable dams downstream, watercourse size and water temperature. Age estimates and histological examinations of gonads indicate that stocked eels in these tributaries are largely slow growing, and sexually undifferentiated.

Friday, March 2nd, 9:30 am

Distribution and habitat associations in stocked American eels, (Anguilla rostrata), in Lake Ontario tributaries, Moira and Napanee Rive

Megan Lloyst* (Trent University), Scott Reid (Ontario Ministry of Natural Resources), Thomas Pratt (Fisheries and Oceans Canada), and Michael G. Fox (Trent University)

The abundance and distribution of American Eels (Anguilla rostrata) has significantly decreased from freshwater and coastal habitats of eastern North America and the species is now considered endangered under the Ontario Endangered Species Act. Stocking experiments have been initiated in Lake Ontario and the Upper Saint Lawrence River to increase local freshwater population densities. As part of a post-stocking monitoring program, we characterized local patterns of eel abundance and size, and identified microhabitat associations in the Moira and Napanee rivers, both of which enter Lake Ontario through the Bay of Quinte.

Point sampling by backpack electrofishing was conducted at multiple sites in the two rivers, downstream of dams. The main habitat predictors assessed were water depth, flow and substrate composition. In addition, distance of sampling points from river banks and dams were also assessed because these features are expected to influence eel abundance. Gonad samples were preserved for sex determination in order to assess if sexes preferred different habitats.

Eel abundance was highest below dams and closer to the mouth of the rivers. Using generalized additive models, we found depth and distance to dam influenced the presence of eels in the Moira River and depth and substrate type- cobble, in the Napanee River. Canonical correspondence analysis associated larger size eels (>251 mm) with deeper water with higher velocities and cobble and gravel substrate close to dams. Smaller eels (<150 mm) were associated with rubble and layered bedrock substrates located closer to river banks. A subsample of our catch was sexed and all eels were identified as either female or undifferentiated, no males were identified. Females were associated with deeper habitats close to river banks with layered bedrock substrate. Undifferentiated eels were associated with gravel substrates and higher velocities close to dams.

Friday, March 2nd, 9:50 am

A comparison of the sex ratio and growth of stocked and wild American eels (Anguilla rostrata) in Lake Ontario and the Upper St. Lawrence River

Joshua Stacey*(Trent University), Thomas C. Pratt (Fisheries and Oceans Canada), and Michael G. Fox (Trent University)

In an effort to mitigate the widespread decline of American eels (*Anguilla rostrata*) in Lake Ontario and the Upper St. Lawrence River (USLR/LO), DFO, OPG and MNR have implemented a stocking experiment from 2006 to the present. Glass eels, harvested from freshwater streams in Nova Scotia and New Brunswick, were purchased from commercial fisherman and stocked into the USLR/LO to supplement the population therein. Historically, the USLR/LO population was exclusively comprised of females, with relatively slower growth rates and a much longer period of growth before sexual maturity is reached, allowing individuals to reach a greater overall size, as compared with eels residing on the east coast of Canada. It has been widely postulated that eel growth and sex determination are driven by environmental factors such as water type and eel density, and based on this rationale it was assumed that stocks taken from coastal maritime habitats would yield a population in the USLR/LO similar to their wild conspecifics. In contrast, preliminary results have shown that the stocked eels are comprised of significantly fewer females than their wild counterparts (61.9% and 97.5% respectively), and are growing 2-3 times faster. In addition, stocked eels from this project have been observed migrating out to sea after just 3-4 years of growth, which is in stark contrast to the 15-20 year period that wild females are believed to spend in the (USLR/LO). These initial results suggest that stocks taken from these maritime streams may not be suitable to supplement a population in the USLR/LO with demographic traits comparable to historical wild eels.

Friday, March 2nd, 10:30 am

Applications and limitations of the effective population size concept for fisheries management

Mohammed Alshamlih* (Trent University), and Chris C. Wilson (Ontario Ministry of Natural Resources)

The idea of using effective population size (Ne) estimates as monitoring tools for wild populations was first proposed decades ago, but has only recently become practical with the advent of genetic point estimator methods. 'Effective population size' is the theoretical number of individuals in an ideal population that shows the same amount of genetic drift as the population of interest. This value reflects the viability and adaptive potential of wild populations, as it is inversely correlated to population-level inbreeding and reflects the probability for losing beneficial alleles and fixation of deleterious ones within populations. In this study, we compared the efficacy of different Ne point

estimators as monitoring tools in wild brook trout populations, Algonquin Park, in comparison with population estimates based on mark-recapture data. Ne estimators which are not affected by sample size (LDNe, He and ONeSAMP) detected evidence of population declines consistent with field observations, whereas another estimator based on interindividual relatedness (Sibship) did not. These findings indicated that Ne estimates may be valuable for inferring population trends as well as for monitoring genetic diversity within wild populations. Effective population size estimates provide useful, time-efficient and quantitative tools for population management, and show good potential for integration into conservation and management planning.

Friday, March 2nd, 10:50 am

Comparison of a single and multi-gear approach to generating index of biotic integrity scores for the Detroit River area of concern

Jason Barnucz*, Robin Gaspardy, Mike Parna, and Nicholas E. Mandrak (Fisheries and Oceans Canada)

To assess changes in the fish assemblage related to restoration efforts in the Detroit River Area of Concern (AOC), fishes have been sampled intermittently between 1990 and 2011. In general, Index of Biotic Integrity (IBI) scores have not improved over this time period. This may be the result of the IBI not sensitive to restoration efforts or based on incomplete assemblage data as a result of gear bias, or restoration efforts not having the intended consequences. To examine the gear bias hypothesis, Fisheries and Oceans Canada (DFO) sampled fish assemblages at six sites in the Detroit River Area of Concern using two gears in 2011. Historically, these sites have been used to evaluate the overall health of the Detroit River using the IBI based on the fish assemblage sampled using boat electrofishing and trawling gear. Electrofishing has been found to be biased towards larger fish species and is strongly influenced by water chemistry (i.e. conductivity). Gear, such as seining or trawling, is not influence by water chemistry but can be biased towards smaller-bodied fishes and is not as easily deployed in river environments. Results of the 2011 sampling demonstrated that trawling (IBI = 23), electrofishing (IBI = 25) and combined (IBI = 21) can yield a more robust IBI metric. However, it may also reinforce that IBI scores may not be sensitive enough to evaluate change effectively for Great Lakes Areas of Concern over time.

Friday, March 2nd, 11:10 am

Movement and thermal ecology of adult walleye from the Tittabawassee and Maumee Rivers

William M. Bowden*, Karen Murchie, Steven J. Cooke (Carleton University), John M. Dettmers (Great Lakes Fisheries Commission), Christopher Holbrook (U.S. Geological Survey), and Christopher S. Vandergoot (Ontario Department of Natural Resources)

Walleye are an important commercial and recreational fish in Saginaw Bay and Lake Erie, playing an integral role in keeping our Great Lakes fisheries lucrative. Understanding walleye movement and thermal ecology within and between Lake Huron and Erie based on biological and environmental parameters will help better define populations as manageable units and improve population and harvest estimates. This study will determine the association of sex, size and age on walleye movement and thermal habitat from the Tittabawassee (Lake Huron tributary) and Maumee (Lake Erie tributary) Rivers. GLATOS (Great Lakes Acoustic Telemetry Observation System) is being utilized to track 200 walleye from the Tittabawassee River and 200 walleye from the Maumee River (50/50% gender ratio per river). The tracked walleye were tagged between March 28 and April 4 through coelomic implantation of V16 transmitters equipped with I-button temperature loggers. Since tagging, 116 walleye were detected at the opening of Saginaw Bay moving out into Lake Huron from the Tittabawassee. 3 Tittabawassee walleye have also been detected at the opening of the Huron-Erie corridor while 1 Maumee walleye was detected. These movements indicate that Saginaw Bay is acting as a source population for Lake Huron and that mixing between the Lake Huron and Lake Erie populations are occurring.

Friday, March 2nd, 11:30 am

Contributions and comparative fitness of hatchery-stocked walleye and wild recruits in Black Bay, Lake Superior

Shawn R. Garner* (Trent University), Steven M. Bobrowicz (Ontario Ministry of Natural Resources), and Chris C. Wilson (Ontario Ministry of Natural Resources)

Black Bay was once home to the largest stock of walleye in Lake Superior, and at its peak supported more than 90% of the commercial walleye harvest from the entire lake. However, the Black Bay walleye stock collapsed in 1968, and has still not recovered despite long-term closure of the fishery. In an effort to restore this stock, more than a million hatchery-produced walleye were released into Black Bay between 2003 and 2005. We used individual-based analysis of genetic data collected between 2007 and 2010 to examine the outcome of these stocking events and to compare fitness traits between hatchery and wild fish. We found that stocking events differed considerably in their effectiveness: the 2003 fry release (Cloud Lake strain) made no measurable contribution to its age class; whereas the 2004 and 2005 summer fingerling releases (St. Mary's River strain) each contributed about half the fish to their respective age classes. Comparisons of adult body mass, total length and condition all showed that hatchery and wild fish were similar in size. However, hatchery fish rarely utilized the river habitat where Black Bay walleye historically spawned, and there was little genetic evidence of interbreeding or natural recruitment of stocked fish. Overall, our results suggest that exogenous stocking has limited potential to contribute to the recovery of walleye in Black Bay.

Friday, March 2nd, 12:50 pm

Highland Creek fish habitat model: a prototype for assessing the habitat benefits of restoration projects.

Brian Hindley* (Golder Associates) and William Snodgrass (City of Toronto)

In the late 1990's, The City of Toronto embarked on a proactive approach to addressing ongoing, issues associated with its aging stormwater/wastewater infrastructure. A key objective of this program was to develop means to effectively plan for infrastructure repair/replacement, rather than deal with costly, unpredicted infrastructure failures and emergencies as they occurred. Significant principles of this strategy were to recognize that water was a resource to be managed as close to its source as possible; and that the City's river and stream networks were a vital component of the City's infrastructure that required the same attention as its "engineered" infrastructure (pipes, trunks, storage facilities, etc.).

The City completed its Wet Weather Flow Management Strategy in the early 2000's, which outlined a 25 year strategy focusing on implementing a range of source, conveyance, end-of-pipe and instream measures in each of its six watersheds and the waterfront drainage. A key conclusion was that out-of channel measures alone were insufficient to bring local hydrology/hydraulic conditions into regime with the City's receiving waters and as a result stream and valley restoration projects were required. In 2004, the City commissioned the Highland Watershed Geomorphic Systems Master Plan, a watershed-wide assessment of instream conditions that included an assessment of fish and fish habitat, and an inventory and assessment of the level of risk associated with existing infrastructure in relation to stream processes. Valley Segment-based Restoration Plans were developed to address these risks and a prioritized list of projects was developed to be implemented over the short and long term.

A key component of the Highland Master Plan was to evaluate the potential fish habitat benefits, in a semi-quantitative way, to satisfy DFO's no net loss policy. A simple spreadsheet model was developed that consists of a quantitative component, defined by broad channel dimensions and flow characteristics, that could be modified by key semi-quantitative physical habitat components, including: Riparian Habitat, Stream Morphology, Channel Stability, Bank Treatment and Floodplain Connectivity. Finally, qualitative modifiers including indices for Fish Community Type, Water Quality Metrics and Presence of Barriers were used to reflect indirect habitat influences.

The fish habitat model was used to estimate fish habitat under existing conditions, then with the Valley segment master plans in place, to allow for an assessment of overall habitat benefits to be made.

Friday, March 2nd, 1:00 pm

A comparison of fish spawning restoration efforts in the Detroit River.

Ellen George, David Bennion (U.S. Geological Survey), James Boase (Waterford Fisheries Station), Emily Bouckaert, Jaquie Craig (U.S. Geological Survey), Rich Drouin (Ontario Ministry of Natural Resources), **Stacey Ireland***, Greg Kennedy, Bruce Manny, Edward Roseman, Jenny Sutherland, and Patricia Thompson (U.S. Geological Survey)

At the turn of the 20th century, the Detroit River supported thriving populations of ecologically and economically important fishes such as lake sturgeon, lake whitefish, and walleye. Decades of habitat alteration and over-harvest in this river have significantly reduced spawning and recruitment function for most of these fish species. Efforts to reestablish active spawning by several fish species in the Detroit River began in earnest in 2004 with the creation of three spawning beds at Belle Isle near the head of the river, using large broken limestone, cobble and coal cinders; materials chosen to imitate known, active spawning areas within the Great Lakes Basin. Restoration efforts continued in 2008, when a US-Canadian partnership constructed 12 more spawning beds 19.5 km downstream near the head of Fighting Island. Materials used at this second restoration site were similar in structure (i.e., limestone and cobble) to the Belle Isle site but differed in rock size, amount of material, and bed placement. To determine how the beds are functioning as spawning habitat we compared spawning habitat size, design and construction, placement, and infilling over time between the two sites, as well as pre- and post-construction fish-use from eggs, larvae, and adult fish collected before and after creation of the spawning beds. While structurally similar in nature these two restoration sites have functioned rather differently with regard to fish use. These results provide scientific baseline information for management activities and habitat restoration projects in the Detroit River and other Great Lakes connecting channels.

Friday, March 2nd, 1:20 pm

Northern pike bycatch in an inland commercial trap net fishery: effects of water temperature and net tending frequency on injury, physiology, and survival.

Alison H. Colotelo, **Graham D. Raby***, Caleb T. Hasler (Carleton University), Tim J. Haxton (Ontario Ministry of Natural Resources), Karen E. Smokorowski (Fisheries and Oceans Canada), Gabriel Blouin-Demers (University of Ottawa), and Steven J. Cooke (Carleton University)

In lakes and rivers of eastern Ontario, commercial fishers use hoop nets to target a variety of fishes, but incidentally capture non-target gamefish species such as northern pike (*Esox lucius*). Little is known about the consequences of bycatch in inland commercial fisheries, making it difficult to identify regulatory options. Regulations that limit fishing during warmer periods and that require frequent net tending have been proposed as possible strategies to reduce bycatch mortality. Using northern pike as a model, we

conducted experiments during two thermal periods (spring: 13.8 – 22.9 □C, and summer: 16.6 – 24.2 □C) where fish were retained in nets for 2 d and 6 d. A control group consisted of northern pike that were angled, immediately sampled and released. We evaluated injury, physiological status and mortality after the prescribed net retention period and for the surviving fish used radio telemetry with manual tracking to monitor delayed post-release mortality. Our experiments revealed that injury levels, in-net mortality, and post-release mortality tended to increase with net set duration and at higher temperatures. Pike exhibited signs of chronic stress and starvation following retention, particularly at higher temperatures. Total mortality rates were negligible for 2 d holding periods in spring, 14% for 6 d holding in spring, 21% for 2 d holding in summer, and 58% for 6 d holding in summer. No mortality was observed in control fish. Collectively, these data reveal that frequent net tending, particularly at warmer temperatures, may be useful for conserving gamefish and maintaining the welfare of bycatch in inland hoop net fisheries.

Friday, March 2nd, 1:50 pm

Effect of food abundance on aggressiveness and territory size of juvenile rainbow trout, Oncorhynchus mykiss

Asra Toobaie*, and James W.A. Grant (Concordia University)

Territoriality is thought to be an important mechanism of population regulation in stream-dwelling salmonids. Since territory size can limit salmonid abundance, describing the exact relationship between territory size and important environmental variables, such as food abundance, is crucial to understanding the role that territoriality plays in regulating population size. Models of optimal territory size predict that territory size should decrease with an increase in food abundance. While this prediction has now been supported by a limited number of studies in salmonids too few levels of food abundance were used to describe the quantitative relationship between territory size and food abundance. Hence, we manipulated food abundance over a broad range of values (0.62, 1.25, 2.5, 5, 10, and 20% of the fish wet body weight per day) in artificial stream channels (1.92 x 0.77m) and monitored the territorial behaviour of juvenile rainbow trout (*Oncorhynchus mykiss*). First, we tested whether salmonids cease defending territories when food abundance is scarce and too high, as predicted by threshold model of feeding territoriality. Second, we quantified the relationship between territory size and food abundance by testing the following predictions: with increasing food abundance, territory size (1) does not change; (2) decreases with a slope of -1.0; or (3) decreases with a slope that is shallower than -1.0. As predicted by the threshold model of feeding territoriality, there was a dome-shaped relationship between the frequency of territorial aggression and food abundance. The aggressive radius of rainbow trout decreased with increasing food abundance but with a shallower slope than – 1.0, suggesting that territory size changed less than one would expect if fish were maintaining a constant amount food in their territory. The result our study suggests that an increase in food abundance would

have a relatively small effect on territory size and thus on the density of juvenile salmonids.

Friday, March 2nd, 2:10 pm

Consequences of incidental capture of freshwater turtles in commercial fisheries

Lauren J. Stoot*, Nicholas A. Cairns, Steven J. Cooke (Carleton University), and Gabriel Blouin-Demers (University of Ottawa)

Bycatch is the capture of non-targeted species and frequently occurs in commercial fisheries. Captured individuals are exposed to a wide range of stressors. Interactions with fishing gear can cause both acute and chronic issues influencing the health, condition, and behaviour of the individual. In extreme cases, animals may die. Freshwater turtles are frequently encountered as bycatch in fyke-net fisheries in eastern Ontario. Turtle mortality associated with bycatch is a conservation concern due to their at-risk status and life-history characteristics including delayed maturation and high adult survivorship. The purpose of the current study was to test three turtle species for the presence of acute and chronic physiological and behavioural consequences of capture in commercial fishing nets. We simulated stressors that captured turtles would experience and measured physiological parameters on three typically encountered turtle species. Our work showed that entrapped individuals displayed considerably higher blood lactate and lower blood pH values compared to free-living control individuals. Moreover, entrapped turtles had reflex impairments that were not apparent in control turtles. Collectively, this and future research will clarify the role of fisheries interactions on the post-release behaviour and survival of turtles.

Friday, March 2nd, 2:30 pm

So why do we still have state fish hatcheries in Michigan in the 21st century: an evaluation of the role of and interplay between fish production and management.

Gary E. Whelan* (Michigan Department of Natural Resources)

Fish production systems still play a key role in fisheries management in the 21st century. They have evolved from a "Johnny Fishseed" role spreading fish to all corners of the globe to creating "instant" and often very artificial fisheries to being a primary tool to manipulate ecosystems using through predator infusion. Michigan's Fish Production Section is a service entity to the resource managers delivering ordered fish of the requested species, strain and size at the proper time and location. The Michigan Department of Natural Resources operates 6 large fish hatcheries (75,000 kg/year capacity for each), 5 primary egg take weirs, and 40-60 extensive rearing ponds that produce 10-40 million fish of 20-22 different species/strains to meet fish and ecosystem management needs. The system has evolved into a tool that produces fish to: restore extirpated species; rehabilitate depressed fish population; change or maintain ecosystem balance; and provide diverse fishing opportunities. Each fish stocking requested by

managers should meet these objectives and is, in theory, a management experiment supported by a "hypothesis" and evaluation, often a significant shortcoming of the process. While marked hatchery fish have played a role in examining ecosystem function, the advent of truly large-scale marking has provided fish managers and researchers a key tool in marked hatchery fish to answer questions of ecosystem stability and resilience, opening the door to a new area of interplay between disciplines. The ability of many fish hatcheries to have controlled environments is now being appreciated as ideal locations to test and parameterize bioenergetics models and such models also have significant implications for energy flow analysis in ecosystems and for mundane issues such as effluent control from fish hatcheries. Finally, we are just now acknowledging the current and likely future role of fish hatcheries to help alter natural mortality rates through disease control using very high quality-disease free fish to dilute pathogen transmission abilities in the wild. The role of fish production systems has dramatically changed from being "The Fishery" to being a key partner in understanding, molding and managing ecosystems.

Friday, March 2nd, 3:05 pm

Identification of possible topics for workshops at future conferences.

Dean Fitzgerald* (EXP), **Sylvia D'Amelio***, and Jack Imhof (Trout Unlimited)

During 2011, the members of the Ontario Chapter of AFS identified a willingness to participate in focal training courses during the Annual General Meeting (AGM). Since then, discussions have occurred, and this resulted in the identification of a number of possible course topics. As such, the time has come to review these possible course options for the AGM, and to again solicit guidance from the members. This presentation will initially review a list of topics for possible future courses. We will then review approaches that could be used for the timing and delivery of the courses at the AGM. In order to have members participate in this process and share their views, an open discussion forum will follow the presentation.

Saturday, March 3rd, 08:30 am

The effect of dreissenid mussels on the strength of density dependent growth and recruitment of Lake Whitefish in Lake Huron

Jenilee Gobin* (Trent University), Erin S. Dunlop (Ontario Ministry of Natural Resources), and Michael G. Fox (Trent University)

Density dependence is a form of ecological feedback that can play an important role in a population, impacting the relationship between population density and individual growth, and altering the recruitment process. The strength of density dependence can shape population dynamics and a population's response to harvest. For the present study, we

evaluated the strength of density dependent growth and survival of Lake Whitefish in one of the largest lakes in the world, Lake Huron.

Lake Whitefish support a significant commercial fishery in the Laurentian Great Lakes, and are the most harvested fish species in Lake Huron. Despite the economic importance of this population however, density-dependent growth and stock-recruitment relationships have not been described for Lake Whitefish in Lake Huron. We focused on Lake Whitefish in southern Lake Huron and evaluated the relationship between population density and two factors (1) individual growth and (2) the biomass of juveniles recruited to the population.

We found evidence that while both growth and recruitment decreased over the entire study period (1985 to 2009), relationships between these factors and density appear to have changed in the years just after the invasion of dreissenid mussels. Prior to dreissenid invasion, growth decreased with increasing abundance; however, this trend did not continue after the dreissenid invasion. Furthermore, while a positive trend was observed between growth and cumulative growing degree days before dreissenid establishment, growth decreased with increasing cumulative growing degree days after dreissenids became established.

Stock-recruitment relationships also changed in recent years. Predictions from a statistical catch-at-age stock assessment model found little variance in adult abundance but highly variable recruitment in years following dreissenid establishment. Additionally, increasing annual growing degree days negatively impacted recruitment for the post-invasion time period but had little effect prior to that. Taken together, our results support existing claims that availability of high quality food sources has likely become a primary limiting factor for lake whitefish in the Great Lakes following the establishment of dreissenid mussels, and that this has impacted the strength of important ecological feedbacks.

Saturday, March 3rd, 8:50 am

Nine years of round goby research in the Trent-Severn Waterway: what we have learned from this biological invasion

Lee F.G. Gutowsky*, Jacob W. Brownscombe, Graham D. Raby (Carleton University), and Michael G. Fox (Trent University)

Given widespread publicity, today both North American fisheries professionals and recreational anglers are probably at least somewhat familiar with the round goby (*Neogobius melanostomus*) and its impacts on ecosystems where it has invaded. For those who have not seen or heard about this small benthic fish, round goby are native to the Ponto-Caspian Sea and since 1990 spread from the area of introduction in Lake St. Clair across the Laurentian Great Lakes, including many of tributaries. Several biological characteristics (e.g. rapid generation time) and transport vectors have allowed this goby to invade novel habitats (e.g. ship ballast-water and illegal angler bait bucket transfers). A bait-bucket transfer has been implicated in the establishment of round goby in 2003 at a central location of the Trent River in south-central Ontario. Here round goby have

increased in density and spread upstream and downstream along an invasion pathway. Goby in the Trent River have created opportunities to generate hypotheses on diet variation along an invasion pathway, shifts in life history strategy, the demographic characteristics of biological invasions, the effects on the piscivore fish community, and the rate of invasion. The round goby invasion of the Trent River, and today Rice Lake and the greater Trent-Severn Waterway (TSW), has suggested that density plays an integral role in the diet, life history, and demographic characteristics of the invasion. In addition, round goby are targeted by predators in high density areas relative to areas of lower density and goby are shown to expand their geographic range at a rapid rate (~14 km/yr). Although an undesired non-native species, the round goby of the TSW serves as a model system that has provided detailed theoretical (e.g. life history theory) and practical (e.g. range-expansion rate) information about biological invasions in rivers and lakes.

Saturday, March 3rd, 9:10 am

The behavioural basis of trapping an invasive species: lessons learned from the sea lamprey

Andrew M. Rous*, and Rob L. McLaughlin (University of Guelph)

We tested whether large-scale manipulations of discharge influenced the behaviour of spawning-run sea lamprey (*Petromyzon marinus*), an invasive species in the Laurentian Great Lakes, in a manner that increased their susceptibility to trapping near the Clergue Generating Station on the St. Marys River. Invasive animals are becoming the focus of management concern in many ecosystems across the globe. Trapping is a potentially valuable form of control. For sea lamprey, increased trap success in large rivers is desired to meet the management objectives of a binational control program. One hundred and sixteen sea lamprey were tagged with passive integrated transponder tags and released downstream of the generating station. Antennas at two traps monitored when sea lamprey approached, and left or entered, a trap. Multi-state Markov (MSM) models were used to test how transition rates between being unavailable and available to be trapped, and between entering and leaving a trap, differed with night-to-night manipulations of discharge through the power plant. Sea lamprey altered their behaviour in response to discharge, but the changes did not result in increased trapping success. Sea lamprey were approximately two times more likely to approach a trap when discharge was high than when it was low, but they were approximately five times more likely to leave the trap rather than enter. This study found that overall trapping success was approximately twenty percent. Overall trapping success was also no higher on nights with high discharge than nights with low discharge. Our study demonstrates that the behavioural responses of sea lamprey to changes in discharge are complex and additional stimuli are likely needed to encourage sea lamprey to enter a trap.

Saturday, March 3rd, 9:30 am

Molecular tools for the detection of invasive snakeheads in North America

Natasha R. Serrao*, Dirk Steinke, and Robert H. Hanner (University of Guelph)

Snakeheads (Family: Channidae) represent a diverse group of opportunistic predators endemic to Asia and Africa. They enter North America through the live-food fish market and have been released into waterways in Florida, Hawaii, and Maryland establishing invasive populations that pose a threat to indigenous freshwater biodiversity. Understanding pathways of invasion requires access to accurate species identification, which can be challenging for this group. Recently, DNA barcoding has gained attention as a powerful tool for identifying diverse fishes and has the benefit of being suitable for the identification of all life stages and even fragmentary remains. The aims of this study are to 1) build a library of mitochondrial 5' COI DNA 'barcode' sequences derived from expert identified reference specimens in order to 2) test the utility of barcoding to discriminate among species drawn from a comprehensive collection of snakeheads, 3) to determine the identity of the invasive species found in North America using barcoding, and 4) to exploit species-specific patterns of sequence variation in the barcode library to develop Taqman assays needed to 5) detect invasive *Channa* species from the environmental DNA (eDNA) they shed into North American waters using quantitative real-time PCR.

Ninety tissue samples representing twenty-one Channidae species were sourced from eleven countries, including the three invasive species from North American waters. Total genomic DNA was extracted and DNA barcodes were PCR amplified and bi-directionally sequenced according to standard Fish Barcode of Life (FISH-BOL) protocols. Sequence and specimen meta-data (including images) was archived and aligned with other published data using the Barcode of Life Data Systems (www.BOLDSystems.org), yielding a combined data set of 175 specimens representing 24 species. Results from genetic distance-based analyses demonstrate that DNA barcodes can be used to diagnose most species but high intra-specific variation was observed among specimens of *C. gachua* and *C. striata* suggesting the presence of cryptic diversity. Invasive snakeheads in Lake Wylie, North Carolina, were reported as *C. argus* but were actually identified as *C. maculata* using barcodes. Probe design for remote detection of varied snakehead species from eDNA using qPCR will be discussed.

Saturday, March 3rd, 9:50 am

Fanning behaviour and communication in the round goby (Neogobius melanostomus), an invasive fish

Kristina Wantola*, and Lynda Corkum (University of Windsor)

Pheromones are important olfactory signals used by animals to communicate with both conspecifics and heterospecifics. There is an important trade-off between dispersal over

long distances and concentration of the signal. Some species overcome this problem by using specialized organs to facilitate the dispersal of pheromones. Since male fish begin to fan their fins before spawning occurs, the fins are likely used to facilitate pheromone dispersal. The round goby is an invasive fish species in the Great Lakes. Current measures of reproductive status (gonadosomatic index, 11-ketotestosterone levels) can be unreliable and require the fish to be sacrificed. Nest guarding male gobies fan with their pectoral and caudal fins before spawning occurs, suggesting that fanning could be used as an indicator of reproductive status. Male gobies release sex pheromones to attract females to the nest likely through fanning (pumping) water out of the nest over a distance of 35 cm. The objective of this study was to determine if male fanning is associated with male reproductive and/or other morphological traits. Using video recordings of male fanning behaviour, rates were calculated and related to various characteristics of the male. A significant positive relationship was found between pectoral fanning rate and GSI however there was no relationship between caudal fanning and GSI or fanning and 11-ketotestosterone levels. A negative relationship between tail length and caudal fanning rate was also found. Surprisingly, no relationship was found between GSI and 11-ketotestosterone. The ability to manipulate breeding in round gobies by dispersal of released pheromones might lure females to traps and away from areas where they negatively interact with native species. If we are able to better identify reproductive males (i.e. males that release sex attractants), it would enhance our ability to control this species in designated areas where round gobies negatively affect native fishes.

Saturday, March 3rd, 10:30 am

Habitat occupancy by Lake Whitefish (Coregonus clupeaformis) includes an ecotone in the profundal zone of two Canadian Shield Lakes

Adam Challice*(Trent University), and Mark S. Ridgway (Ontario Ministry of Natural Resources)

Temperature and dissolved oxygen preferences have traditionally defined habitat for Lake Whitefish (*Coregonus clupeaformis*). These parameters produce volumetric estimates of habitat largely in the hypolimnion without regard to spatial structure. The purpose of this study was to determine if structure was important in defining Lake Whitefish habitat. We estimated habitat occupancy patterns for Lake Whitefish using a multi-pass survey approach based on randomly-stratified gillnets in two lakes (Lake Opeongo and Smoke Lake). Multi-pass surveys permit separation of detection from occupancy as a function of habitat covariates. Essentially, sites where whitefish appear absent (zero catches) can be modeled for occupancy based on covariates. Habitat covariates, including temperature, light, depth, and substrate habitat via acoustic classification were modeled at two different spatial scales, the scale of the net employed and a presumed movement scale. Both scales demonstrated the importance of depth and proximity to a previously underappreciated ecotone in the profundal zone. Based on model selection, both depth and a substrate ecotone (the gradient between softness-hardness) best described occupancy of lake whitefish in Lake Opeongo. Lake Whitefish

occupied deeper water in Smoke Lake and did not show an adherence to the substrate ecotone. Diurnal behaviour appeared to be important in the detection process with morning activity leading to greater detection than afternoon activity. This multi-pass approach demonstrated spatial structure in Lake Whitefish habitat selection. It also revealed the importance of a little known but key habitat feature – the E2 ecotone. This feature aligns with internal wave structure of the thermocline and appears where the thermocline contacts the lake substrate. The role of this ecotone as fish habitat was unrecognized prior to this study but may have important implications for other benthivorous fish in Canadian Shield lakes.

Saturday, March 3rd, 10:50 am

Redshift: the enigma of the evolution of erythrocytes in fish

Norm Quinn* (Ontario Ministry of Natural Resources)

There is great variation in the size and structure of erythrocytes among vertebrates and this variation has intrigued biologists since the 1800's. In fish, smaller erythrocytes are associated with greater swimming ability and higher metabolism. There is also a clear relationship with phylogeny: specifically, extant species whose earliest ancestors recognizable as such appear earlier in time have larger red blood cells than more recent taxa. This appears to be due in part to events of polyploidy; more "primitive" fish have larger genomes due to ancient events of polyploidy that seem to have been reversed in more recently evolved groups. Polyploidy may have been a major driver in the evolution of fish and continues to occur.

Saturday, March 3rd, 11:10 am

Risk taking, not foraging tactics form the basis for individual differences in propensity to disperse in young brook charr

Alan H. Edelsparre*, Rob McLaughlin (University of Guelph), and M A. Rodríguez (Université du Québec à Trois-Rivières)

Several hypotheses predict that individual differences in migration and dispersal are related to individual differences in routine behaviour, including foraging and risk taking. We tested whether short-term dispersal of recently emerged brook charr *Salvelinus fontinalis* was correlated with differences in activity during prey search in the field (a measure of foraging tactic) or in the time taken to exit a dark tube into an unfamiliar field environment (a measure of risk taking). For one sample of fish, we tested whether an individual's propensity to disperse in a standardized dispersal test in the lab was correlated with its activity during prey search and its exit times in the field. For another sample of marked, released and recaptured fish, we tested whether an individual's minimum displacement distance over 6 days in the field (a measure of field dispersal)

was related to its propensity to disperse in the lab. For the first sample, an individual's propensity to disperse in the lab was correlated with risk taking only, but, contrary to expectation, individuals with long exit times (risk-avoiders) dispersed farther than those with short exit times (risk-takers). For the second sample, dispersal in the field was also correlated with propensity to disperse in the lab, but, contrary to expectation, individuals with greater displacements in the field displayed lower propensities to disperse in the lab. Our findings demonstrate that individual differences in juvenile dispersal are related to differences in risk taking behaviour, but not in foraging tactic, and that the nature of this relationship can depend on environmental context. These findings are consistent with the hypothesis that individuals differing in risk taking behaviour can contribute disproportionately to ecological processes involving long-distance movement.

Saturday, March 3rd, 11:30 am

Novel molecular phylogeny of the Lepisosteidae and identification of specimens of unknown origin

William Glass*, Ryan Walter, Daniel Heath (University of Windsor), Nicholas Mandrak (Fisheries and Oceans Canada), and Lynda Corkum (University of Windsor)

Phylogeography, the study of the evolutionary relationships among populations or species across geographic space, allows for the inference of past events such as dispersal, colonization and isolation. In this study, we have created a phylogeny based on the mitochondrial Cytochrome Oxidase 1 (CO1) gene and the mitochondrial Cytochrome B gene for the family Lepisosteidae. CO1 and Cytochrome B sequences were generated by sequencing mitochondrial DNA for several individuals from four North American *Lepisosteus* species and from published sequences available for the other three species on GenBank. Multiple haplotypes of CO1 were seen for the Florida Gar (*Lepisosteus platyrhincus*); while only a single haplotype was found for its closest relative, the Spotted Gar (*Lepisoteus oculatus*). The topology of the phylogenetic tree resembles that created by Grande (2010) based on morphometric characters, showing two distinct genera. The molecular based tree, however, has Shortnose Gar (*Lepisosteus platostomous*) closely related to Longnose Gar (*Lepisosteus osseus*), while Grande (2010) places the Longnose Gar closer to the clade containing Spotted and Florida Gar. Our phylogeny, the first molecular-based phylogeny for this family of large piscivorous fishes, indicates an interesting pattern of post-glacial colonization and expansion among species found within temperate zones as well as island colonization and subsequent speciation in sub-tropical and tropical regions. The analyses permit the identification of several specimens obtained through the aquarium trade and one specimen from a live food-fish market to the species level.

Gold Level Sponsors

Royal Ontario Museum

Ontario

Fisheries and Oceans Canada | Pêches et Océans Canada

HALLTECH Aquatic Research Inc.

Conservation Ontario

HOSKIN SCIENTIFIC

Stantec

Silver Level Sponsors

EcoMetrix INCORPORATED

LOTEK WIRELESS FISH & WILDLIFE MONITORING

Biotactic FISH AND WILDLIFE RESEARCH

exp.

Bronze Level Sponsors

Backroad Mapbooks

Hook Line & Sinker Fishing Tackle

Ontario Waterpower Association

Ontario Federation of Anglers and Hunters