

39th Annual Meeting of the Atlantic International Chapter



39^e Congres annuel du Chapitre international de l'Atlantique

Sept. 22 – 24, 2013

Schoodic Education and Research Center Institute,
Winter Harbor, ME

Sunday, September 22nd

5:00 pm - 7:00 pm

Registration

Sunday Evening Session
and Mixer (snacks and
beverages provided)

7:00 pm - 9:30 pm

Graham Goulette – Coming to life: animated visualizations of Atlantic salmon smolt tracks

John Magee – Brook trout response one year after instream wood additions

Doug Smithwood & Eric Bruestle – A Case Study of the Creation, Design and Implementation of an American Eel Management Plan and Assessment Plan

Michael Bailey – Update on Atlantic Salmon in Merrimack River

Open Microphone - Informal Presentations of what you have been working on....

Monday, September 23rd

7:00 am - 8:00 am **Breakfast**

8:10 am - 8:30 am **Welcome and Introductions**

8:30 am - 9:10 am **Keynote Speaker: Bruce Connery** – Shifting Awareness and Management of Wildlife in the 21st Century at Acadia National Park

Technology

9:10 am - 9:30 am **James Hawkes** – Evaluation of river specific Age-1 hatchery reared Atlantic salmon smolts using acoustic telemetry

9:30 am – 9:50 am **Jason Duff** – Using acoustic telemetry to enhance understanding of alewife out-migration behavior

9:50 am - 10:10 am **Jesse Wechsler** – 2012 Downstream Silver Eel Passage Study - Kennebec River

10:10 am - 10:30 am **Coffee Break**

Fisheries Management

10:30 am - 10:50 am **Rosie MacFarlane** – Silent Streams: The Impact of Impoundments on Headwater Streams in Prince Edward Island, Canada

10:50 am – 11:10 am **Joe Norton** – Stream Restorations using Grip-hoist Techniques

11:10 am - 11:30 am **Jud Kratzer** – The Vermont Master Angler Program: Catching Bass and Taking Names

11:30 am - 11:50 am **Nate Wilke** – Populations in Peril: Limiting negative impacts of captive rearing on an endangered population.

12:00 pm - 1:00 pm **Lunch**

Ecology

| | |
|-------------------|--|
| 1:30 pm - 1:50 pm | Miguel Barajas - Running the gauntlet: Smallmouth bass predation on river herring in the Kennebec and Androscoggin River systems |
| 1:50 pm - 2:10 pm | Theodore Willis - Differences in nearshore food web dynamics between central and downeast Maine |
| 2:10 – 2:30 pm | Danielle Quinn - Evaluating changes to fish assemblage structure in response to non-native species establishment: maps, models, and mathematics |
| 2:30 pm - 2:50 pm | Molly Payne - Using Natural Tags to Determine Marine and Freshwater Habitat Use by Juvenile Blueback Herring |
| 2:50 pm – 3:30 pm | Coffee Break and Poster Session |
| 6:00 pm – 8:00 pm | Dinner and Social |

Tuesday, September 24th

7:00 am - 8:00 am **Breakfast**

8:00 am - 10:00 am **BUSINESS MEETING**

10:00 am - 10:20 am **Coffee Break**

Species focus

10:20 am - 10:40 am **Christine Lipsky** – A Novel Biotic Integrity Index for the Penobscot Estuary

10:40 am - 11:00 am **Julia Whidden** - Characterizing Populations of Striped Bass, Winter Skate, and Little Skate in the Inner Bay of Fundy

11:00 am - 12:00 pm **RAFFLE, LUNKER AWARD, SOGGY BOOT AWARD, AND WRAP UP**

12:00 pm - 1:00 pm **Lunch**

Running the gauntlet: Smallmouth bass predation on river herring in the Kennebec and Androscoggin River systems

The non-native smallmouth bass, (*Micropterus dolomieu*), a highly active predator, was introduced in Maine in the late 1800's in an attempt to replace the less active predator but over-harvested brook trout, (*Salvelinus fontinalis*), and have now firmly established themselves in Maine rivers. Smallmouth bass have been documented preying on river herring (*Alosa pseudoharengus* and *A. aestivalis*), a native forage fish, during its outmigration into marine systems, but the magnitude of this predation is unknown. In order to better manage restoration efforts of river herring and understand the food web impacts of smallmouth bass, we conducted a diet study along the Kennebec and Androscoggin River systems (Kenn/Andro). Monthly from May-October in 2009 & 2010, the Kenn/Andro were sampled for smallmouth bass using hook and line. Stomach contents were collected using non-lethal methods, and the fish were returned to the water alive. The stomach contents were identified and analyzed to a general taxonomic level for analysis and construction of simulations with the Wisconsin bioenergetics model. Temporal trends of diet distributions indicated that river herring are a seasonally important component of the smallmouth bass diet. Androscoggin smallmouth bass consumed more river herring than Kennebec smallmouth bass on a % Index of Relative Importance (IRI) basis.

Miguel Barajas

University of Southern Maine

70 Gray Street, Portland ME 04102

miguel.barajas@maine.edu

Coauthors: Dr. Theodore Willis, Dr. Karen Wilson

Using acoustic telemetry to enhance understanding of alewife out-migration behavior

The alewife (*Alosa pseudoharengus*) is known to play a pivotal role in the food web of the Penobscot River and near shore marine ecosystems. The Penobscot River Restoration has the potential to restore millions of alewife to the watershed just as the species is under review for listing under the Endangered Species Act. However, little is known regarding the behavior of this species prior to or after they leave natal lakes. Acoustic telemetry is a technology that can be used to track the movement of tagged fish in order to provide insight into behavior of individuals in a river through both temporal and spatial lenses. Over the summer of 2009, using the telemetry array deployed by NOAA and the University of Maine, 16 alewives were caught, had pingers implanted orally, and were released into the Penobscot at four sites between Veazie Dam and Brewer. The goals of this study were to determine if acoustic telemetry could be used to track reproductive age alewife during their spawning migration and collect data on their behavior during out-migration after spawning. Preliminary results indicate that the pinger implants were successful in tracking the individuals without significantly disturbing their health or migratory ability. The fish were tracked for an average of 37 days; however, two fish were tracked for less than two days, while two appeared in the array for over 80 days. Passage over Veazie Dam may have been one source of mortality. Preliminary results also suggest that movement was affected by tidal cycle and time of day, and that the fish spent the majority of out-migration time in the estuary zone.

Jason Duff

University of Southern Maine

53 Tyng St., Apt #1, Portland ME 04102

jason.duff@maine.edu

Coauthors: Dr. Theodore Willis; Dr. Karen Wilson

Coming to life: animated visualizations of Atlantic salmon smolt tracks

Northeast Fisheries Science Center (NEFSC) researchers have recently added a new method to study Atlantic salmon smolt emigration behavior in the Penobscot Estuary in Maine. Each April in the Penobscot River, over 500,000 hatchery-reared smolts and about 100,000 naturally-reared smolts begin their migration to the Gulf of Maine. Only a portion of those will exit successfully. Examining smolt behavior to understand how it may affect survival is one part of the process of increasing abundance of this endangered species. While tracking data has been collected since 2005, these data are complicated. Animated visualization provides a tool for researchers and the public to better understand these complex movements. NEFSC researchers are processing 2012 emigrating smolt data collected from 121 acoustic telemetry receivers using V-Track, a program designed by researchers at the University of Queensland to visualize the movements of acoustically tagged animals (Campbell et al. 2012). During their journey through the estuary, smolts must adjust to increasing salinity, changing temperatures, and new food and predator suites as they near the ocean. NEFSC researchers have observed behaviors that may allow smolts to contend with these changes – animations help identify these behaviors. Animated visualizations may also help identify and understand potential schooling behavior as well as allow researchers to animate model data. We'll also discuss the potential of using V-Track to incorporate estuarine fish community biomass, predator survey data, and environmental parameters into the animations. Integrating ecosystem data with smolt emigration data will help to better understand ecological interactions.

Campbell, H.A., Watts, M.E., Dwyer, R.G., Franklin, C.E. 2012. V-Track: software for analysing and visualising animal movement from acoustic telemetry detections. *Marine and Freshwater Research*, 63:815–820 DOI:10.1071/MF12194

Graham Goulette

NOAA NMFS

17 Godfrey Drive, Orono ME 04473

Graham.Goulette@noaa.gov

Coauthors: Kaitlyn Lowder, John Kocik

Evaluation of river specific Age-1 hatchery reared Atlantic salmon smolts using acoustic telemetry

The Dennys River Atlantic salmon stock is at the northern extent of the endangered Gulf of Maine Distinct Population Segment's range. Although the stock once supported a prominent US salmon rod fishery, the population has since collapsed as a result of dams, pollution from an EPA superfund site, overfishing, and poor marine survival. Since 1875 hatchery supplementation has been the primary restoration tool used for the Dennys River salmon. From 1990 to 2000 fry were the primary hatchery product stocked. In 2001, managers decided to begin stocking Dennys origin river-specific 1+ smolts. Based on regional hatchery smolt marine survival it was estimated that stocking 32,000 to 50,000 smolts had a 75% probability of producing 67-117 2SW returns. Approximately 50,000 smolts were stocked annually from 2001 to 2005. To evaluate and describe estuarine and coastal migration performance of these hatchery smolts, we acoustically tagged a subset of smolts (n=70-150) each of the five years. We observed a significant number of reversals in the estuary and bay environments and losses (>50%) that were higher than those documented in other systems. Reversal behavior, while potentially normal for smolts when transitioning into the marine environment, may suggest underlying issues of smolt quality. With few post-smolts making it to the Gulf of Maine and Bay of Fundy, recovery of this stock will be challenging.

James Hawkes

NOAA Fisheries

17 Godfrey Drive Suite #1, Orono ME 04473

james.hawkes@noaa.gov

Coauthors: Tim Sheehan and Dan Stich

The Vermont Master Angler Program: Catching Bass and Taking Names

The purposes of the Vermont Master Angler Program are to collect information on the sizes and locations of large fish caught from Vermont waters, promote the many great fishing opportunities throughout the state, and encourage anglers to learn more about fish species that have not traditionally been popular angling targets. Anglers that catch a fish exceeding the minimum qualifying length in any of the 33 species categories receive a certificate commemorating the catch. A picture of the catch is posted on the Vermont Fish and Wildlife website, and all anglers and their catches are included in the Vermont Master Angler Annual Report, which is also posted on the Vermont Fish and Wildlife website. Anglers that submit qualifying entries in at least five different species categories within a calendar year earn the title of Master Angler and receive a collectible lapel pin. The program has been a great success since its initiation in 2010. In this presentation, we will present an overview of how the program was developed, how it is being administered, and evidences that the program is accomplishing the purposes for which it was developed. This presentation should provide useful insights to other state and provincial agencies that may be interested in developing a similar program or that are already conducting their own angler recognition program.

Jud Kratzer

Vermont Fish and Wildlife Department
1229 Portland St. Suite 201, St. Johnsbury VT 05819
jud.kratzer@state.vt.us
Coauthor: Shawn Good, VT Fish and Wildlife

A Novel Biotic Integrity Index for the Penobscot Estuary

Ongoing management activities in the Penobscot River basin will increase connectivity of the lower river and Gulf of Maine. Because only limited data on the Penobscot estuary were available, we initiated a comprehensive survey of the Penobscot Estuary which includes monitoring components of the fish, marine mammal, and avian communities, and monitoring water quality. Our goal was to understand the current structure and composition of living marine resources. One way to synthesize these data was to establish an index of biotic integrity for comparison with fish communities in the future. Since published indices were not appropriate to the Penobscot Estuary, we developed a novel index, the Penobscot Estuary Monitoring Index (PEMI), which comprised 18 estuarine-specific metrics describing species richness, species diversity, and numbers of fish according to several classification factors. Applying the newly created PEMI to recent data created baseline metric values that can be used for comparison in the future to monitor system changes due to ongoing restoration efforts.

Christine Lipsky

NOAA Fisheries

17 Godfrey Drive Suite 1, Orono ME 04473

Christine.Lipsky@noaa.gov

Coauthor: Halie O'Farrell

Silent Streams: The Impact of Impoundments on Headwater Streams in Prince Edward Island, Canada

The impact of impoundments on water quality in Prince Edward Island rivers has been well documented. What is less understood is the long term impact on lotic habitat and wooded riparian zones following decades of repeated impounding. In the 1970s and 1980s, large shallow impoundments were constructed in the headwaters of rivers, primarily to enhance waterfowl production. Since the last introduction of beavers to P.E.I. in 1949, they have spread throughout the Island. In areas of low topography, the area impounded by humans and beavers can encompass virtually all headwater streams. Many of the former stream reaches so crucial to spawning and rearing of salmonids are no longer suitable and many cold water refuges have been affected. As well, the conversion of wooded riparian zone to brush marshes and grassy meadows in many rivers has been extensive and dramatic. This presentation will give examples of impacts of beaver and human-constructed impoundments on low gradient streams on Prince Edward Island and discuss the implications to native cold water fishes.

Rosie MacFarlane

PEI Department of Agriculture & Forestry
183 Upton Road, PO Box 2000, Charlottetown, PE C1A7N8
remacfarlane@gov.pe.ca

Coauthors: Daryl Guignon, UPEI. Rebecca Hersom Petersen, Morell River Management Co-op

Brook trout response one year after instream wood additions

We have conducted research on a wild Brook Trout (*Salvelinus fontinalis*) population using passive integrated transponder (PIT) tags in a 410 m section of Johnson Brook in northern New Hampshire since 2007. As part of the project, we added freshly-cut logs from the nearby forest to a 120 m section of Johnson Brook in October 2010 with the specific objective of creating more pool and overhead cover habitat to increase the biomass of wild brook trout. We used electrofishing data collected in September 2012 and September 2013 to determine if there appeared to be a response, in terms of overall biomass of wild brook trout, in the eleven months since we added the logs. We will present preliminary results of this work.

John Magee

New Hampshire Fish and Game Department

11 Hazen Drive, Concord NH 03301

john.a.magee@wildlife.nh.gov

Stream Restorations using Grip-hoist Techniques

Trout Unlimited's (TU) Upper Connecticut Home Rivers Initiative (HRI) was launched in 2008 and encompasses the Upper Connecticut River watershed and more than 19 major tributaries in NH, Vermont, and Canada, from Lake Francis in Pittsburg NH to the confluence of the Upper Ammonoosuc River in Groveton NH. TU's HRI is currently working in two major UC tributaries, NH's Indian Stream and VT's Nulhegan River. Like many larger UC tributaries, the historic log drives of the late 1800's caused damage that still exists today. Forested areas were heavily cut, channels straightened, instream boulders and riparian vegetation removed, side channels blocked, and dams were built throughout the watersheds. Many reaches remain wide, straight, shallow, scour repeatedly, lack woody material, and have temperature concerns. The HRI is addressing this damage through riparian plantings, crossing replacements, and habitat restorations with woody material additions. Since 2010, the HRI has been adding wood to streams through "chop and drop" methods, and in 2013, purchased a grip hoist to enhance its techniques. A typical setup costs \$4,000, and is best described as a come-along on steroids or "excavator light". Since then, the HRI has been working with its partners to incorporate a variety of "chop & drop" and "grip & rip" methods. Trees are bent over into the stream separately or in chop & drop jams with root wad still partially intact. Cut trees are pulled back to wedge into their stumps. Larger key pieces are moved into place. Root wads are added to the stream, in whole trees, clusters, in chop & drop sites, and by driving a shaped tip into the stream bank. Mobile wood trees are added to the stream randomly. Boulders are moved to create habitat and add to wood jam stability.

Joe Norton

Trout Unlimited
97 Main Suite 106, Lancaster NH 03584
jnorton@tu.org

Using Natural Tags to Determine Marine and Freshwater Habitat Use by Juvenile Blueback Herring (*Alosa aestivalis*)

Blueback herring (*Alosa aestivalis*) are anadromous fish believed to spend most of their life cycle at sea. Understanding where and when juvenile blueback herring use freshwater, estuarine and nearshore marine habitat is critical to management efforts since recruitment to spawning age is vital to population sustainability. Habitat use is not well understood especially in their northern range. We predicted juveniles with access to greater areas of freshwater/estuarine habitat would show evidence of increased time spent in these habitats due to potential advantages (i.e., decreased predation, increased resources). We used otolith microchemistry and concentrations of Ca, Ba and Sr within fresh, estuarine and marine waters to identify habitat use by individuals in seven Maine river systems. Adult fish were collected in 2010 and 2012 during spawning runs. Total area of available estuarine habitat of study sites ranged from approximately 3520 to 525 hectares. The ambient water concentration of Sr in each habitat was found to be strongly correlated with salinity ($R^2 = 0.9023$) and was used as the primary marker of habitat use (in ratio with Ca). A rapid increase in Sr:Ca was interpreted as migration into seawater. Preliminary results show evidence of juveniles overwintering in estuaries, although within a river system, the timing of seaward migration of individuals was variable; some fish migrated before their first winter, others after. Patterns of habitat use are distinct among several river systems and appear to correlate with estuary size. The significance of Maine estuaries as habitat for blueback herring may be of greater importance than previously thought.

Molly Payne

University of Southern Maine
87 Montrose Ave, Portland ME 04103
molly.payne@maine.edu
Coauthor: Karen Wilson

Evaluating changes to fish assemblage structure in response to non-native species establishment: maps, models, and mathematics

Smallmouth bass (*Micropterus dolomieu*) are an invasive piscivorous fish species in Nova Scotia, thought to negatively impact native fish assemblages through predation and competition for resources. First introduced in the province in 1942, there are now established populations in over 200 lakes and rivers. Over 5000 electrofishing surveys from 72 Nova Scotia rivers reported presence and abundance of 39 freshwater and diadromous fish species between 1965 and 2009. Electrofishing records were used to map the establishment and dispersal of smallmouth bass in LaHave River between 1990 and 2009. The apparent movement of smallmouth bass from the main stem into various tributaries over time may be a result of natural dispersal or multiple introduction events. Multiple sites had records of species presence and abundance both before and after smallmouth bass establishment, and changes to localized native fish assemblages were described in the context of catch-per-unit-area (CPUA) using negative binomial generalized linear models (GLMs). Pairwise calculations of Jaccard's Similarity Coefficient (J) were plotted to visualize instances of homogenization and differentiation of fish assemblages across these sites over time and in response to smallmouth bass establishment. Significant changes over time were noted in the CPUA of native species in LaHave River sites with established smallmouth bass populations. Mathematically, the addition of smallmouth bass should result in homogenization of fish assemblages across sites if the composition (presence/absence) of native fish assemblages do not experience change. However, across sites with established populations of smallmouth bass, homogenization occurred between only 36% of pairwise calculations of similarity. These results are discussed in the context of the "portfolio effect", which suggests that plasticity in life history strategy, diet, and habitat requirements leads to under-utilized niches supporting various species during periods of fish assemblage change or increases/decreases in abundance.

Danielle Quinn

Acadia University

14 Fundy Drive Apt 108, Wolfville NS B4P 1Y4

danielle.quinn@acadiau.ca

Coauthor: Dr. Trevor Avery, Dr. Jamie Gibson

A Case Study of the Creation, Design and Implementation of an American Eel Management Plan and Assessment Plan for the Merrimack River Watershed of Massachusetts and New Hampshire

The recent coastwide stock assessment and ESA listing petition has heightened the emphasis for resource agencies to become increasingly involved in American eel management. In 2013 the Central New England Fishery Resources Office (USFWS) led efforts to create, design and implement an American Eel Management Plan for the Merrimack River watershed. This presentation is a case study of the myriad of factors that were considered in designing a watershed wide American eel management plan with concrete, accomplishable objectives. To obtain a baseline understanding of the effects of current and future management actions, a watershed wide American eel assessment plan is also in development. This presentation will give an overview of the current version of the management plan and discuss the design and implementation of the initial phases of the plan. It is hoped that this presentation will solicit comments and communications among AIC participants to help create a more uniform and informed eel management framework among management agencies. Specifically, there is a need to standardize efforts and techniques in order to collect high quality data that can be used for science based fisheries management.

Douglas Smithwood

Central New England Fishery Resources Office

151 Broad Street, Nashua NH 03063

Doug_Smithwood@fws.gov

Coauthor: Eric Bruestle

Evidence of the Penobscot River Estuary Providing Prolonged River Herring Nursery Habitat

Alewife and blueback herring are two diadromous species of river herring designated by NOAA Fisheries as Species of Concern due to their historically low abundance. The Penobscot River currently maintains remnant populations of river herring and is undergoing a large-scale multi-dam removal restoration project aimed at restoring connectivity between freshwater and marine habitats and improving diadromous fish abundance. River herring use of estuarine habitat is poorly understood but it has been characterized as transitional habitat for migrants rather than a significant nursery area. NOAA Fisheries initiated a comprehensive fisheries survey of the Penobscot estuary to monitor and describe pre- and post- dam removal conditions using mid-water trawling, seining, fyke nets and hydroacoustics. Sampling from April through October 2011 and 2012 confirmed the presence of river herring in the estuary. Further analysis indicates that multiple year classes of river herring use the Penobscot estuary including adults and juveniles (ages 0-2) and that juvenile river herring account for a significant portion of the estuarine biomass during the year. These findings provide a baseline for characterizing the dynamics of this habitat for river herring and their role in the ecosystem. Further investigation is required to determine the ecological significance of this habitat for the Penobscot river herring population and how conditions may change as restoration progresses.

Justin Stevens

NOAA Fisheries

17 Godfrey Drive, Orono ME 04473

justin.stevens@noaa.gov

Coauthor: Richard Dill, Maine Department of Marine Resources; Alexander Borsky, University of Maine; William Duffy, NMFS

2012 Downstream Silver Eel Passage Study - Kennebec River (Madison, Maine)

The Anson and Abenaki hydroelectric projects are owned and operated by UPM Madison Paper Industries (MPI) to support energy demand for paper production. The facilities are located adjacent to one another on the Kennebec River in central Maine in the towns of Anson and Madison, approximately 75 miles upstream of the confluence with the Atlantic Ocean. Since issuance of licenses from the Federal Energy Regulatory Commission in 2004, MPI has developed operational and facility modifications as well as performed studies to assess and promote downstream eel passage at the two stations. In 2012, researchers surgically tagged 34 adult silver eel to monitor downstream passage at Anson and Abenaki. Monitoring was conducted during the period September 19, 2012, through November 5, 2012 with 15 automated stationary radio-telemetry receiver and antenna arrays. Two Oregon RFID half-duplex PIT tag readers with associated loop wire antennas were also installed to detect eel using a secondary bypass pipe at the Anson station. A tally of downstream eel passage through available routes (e.g., interim bypasses, minimum flow gates / spill, or turbine passage) as well as information pertaining to the fate of tagged fish (e.g., lost signal, immobility/mortality) was developed to describe route-of-passage movements at both stations. In total, 22 of 25 eel (88%) migrated from above the Anson station downstream to or past the Abenaki station, indicating successful passage past Anson by any route. In total, 23 of 26 eel (88.5%) passed the downstream most monitoring station, indicating successful passage past Abenaki. Of these, six eel migrated past the Abenaki station during high-river flows associated with Hurricane Sandy (October 30 and October 31).

Jesse Wechsler

Kleinschmidt Associates

141 Main Street, Pittsfield ME 04967

jesse.wechsler@kleinschmidtusa.com

Coauthor: David Lovley, UPM Madison Paper

Characterizing Populations of Striped Bass, Winter Skate, and Little Skate in the Inner Bay of Fundy

Striped bass (*Morone saxatilis*), Winter skate (*Raja ocellata*) and Little skate (*Raja erinacea*) are all at-risk species. Each species was sampled and tagged at a weir in the inner Bay of Fundy to assess their respective population structures. Sampling occurred at a commercial herring weir in the Avon Estuary, NS, from July to September 2012 (skates only), and April to August 2013 (both skates and striped bass). During 2013, over 1300 striped bass were measured and scale samples collected for genetic analysis and approximate aging. There were 31 recaptures from 450 tagged striped bass. Skates were measured for weight, length, and width, sexed, identified to species when possible, and fin clipped for species confirmation. Of 718 tagged skates, 18 were recaptures over the two years. Genetic sequencing of mtDNA cytochrome oxidase I gene of 65 skates indicate that the inner Bay of Fundy population is dominated by Winter skate, with only 10% being Little skate. Catches of striped bass and skates were compared to tide height over the course of the season. Night and early morning tides as well as low-low tides corresponded to increased catches in skates, indicating that skate are more active at night. Lunar cycles were also investigated. Preliminary population estimates are possible with capture-mark-recapture analysis.

Julia Whidden

Acadia University

59B Marsh Hawk Drive, Wolfville NS B4P 1B4

julia.whidden@acadiau.ca

Authors: Trevor Avery, Darren Porter

Populations in Peril: Limiting negative impacts of captive rearing on an endangered population. A success story in Atlantic salmon?

As global biodiversity decreases at alarming rates, captive breeding and rearing programs are among the most widely-used and controversial means to conserve and restore natural populations. Research has demonstrated that exposure to captive conditions, even for minimal time periods, may be linked to reduced fitness in the wild. As such, scientists and managers are investigating means to reduce the potentially harmful impacts of captive breeding and rearing. We use a model species and population, Inner Bay of Fundy endangered Atlantic salmon (*Salmo salar*), to test whether a specific mitigation technique, the ontogenetic exposure to wild conditions, can improve the performance of offspring during early life history. Using a pedigree analysis coupled with Live Gene Bank data from Department of Fisheries and Oceans (Canada), we observed decreased egg mortality in a hatchery setting, and increased wild survivorship of offspring of “wild-exposed” parents compared to offspring of parents raised entirely in captivity. Our results suggest that pursuing such trans-generational effects may offer a means to improve outcomes associated with conservation-based captive rearing and breeding programs.

Nathan Wilke

Memorial University

0 Marine Drive, Ocean Sciences Centre, St. John's NF A1C 5S7

nfwilke@mun.ca

Coauthors: Melissa Evans, PhD, Ian Fleming, PhD, Patrick O'Reilly, PhD

Differences in nearshore food web dynamics between central and downeast Maine

Diet analysis is a long standing traditional method of assessing food web connections in an ecosystem. However, diet analysis is a snapshot method that may miss seasonal predator prey relationships. Conversely, stable isotopes are a reliable and integrative method for assessing food web linkages, but are poor at detecting transitional prey. Together these two methods can reveal more about ecosystem function and predator prey relationships than either alone. Here we describe trophic dynamics in two ecosystems along the Maine coast and compare and contrast their food webs using diets and stable isotopes. Midcoast Maine (Kennebec to St. George) and Passamaquoddy Bay (Western Passage to Perry) were sampled between 2007 and 2011. We collected food web constituents for diet and stable isotope analysis. Using blue mussels to set a trophic level of 2, we found that all the Passamaquoddy food web constituents were significantly lower than those we encountered in Midcoast Maine. Stable isotope signatures were consistent across fast turnover (fin) and slow turnover (dorsal muscle) tissue types for most species tested, except Atlantic mackerel. Mackerel trophic position was significantly lower for fast tissue in Passamaquoddy Bay, indicating that mackerel were likely migrating into the Bay and acquiring the lower trophic level signal there. This was surprising considering that Passamaquoddy Bay was well known for upwelling that supported extensive bottom-up food web production. Burrowing amphipods were common prey items in Passamaquoddy Bay, found in the diets of nearly all fish taken. Our results question whether the observed difference in trophic level and tissue type stable isotope values are natural or induced by anthropogenic activity in the nearshore Gulf of Maine. The results are discussed within the context of finfish and invertebrate fishing, widescale use of pelagic prey for lobsters and current alterations in response to global climate change.

Theodore Willis

University of Southern Maine

37 College Ave, Gorham ME 04038

theodore.willis@maine.edu

Coauthors: Karen Wilson, Beverly Johnson

Evaluation of a Recovery Strategy for Atlantic salmon: The Effects of Stocking Hatchery Raised Juveniles on Top of Wild Populations.

Faced with diminishing adult Atlantic salmon (*Salmo salar*) returns and mysteries surrounding at-sea survival of out-migrating smolts, it is important to maximize in-stream production of the species. Stocking of juvenile Atlantic salmon (*Salmo salar*) is a commonly used recovery and enhancement strategy; however, its effectiveness in increasing juvenile salmon densities and production has never been fully investigated. The purpose of this project is to determine if stocking has increased the overall production of juvenile salmon in the Miramichi River watershed. In order to accomplish this goal, historical electrofishing data has been obtained, allowing for the creation of a geographical model of salmon parr densities through time. This model will allow us to determine which landscape level variables (i.e. slope, upstream catchment area, distance to ocean etc.) best predict salmon parr densities across the watershed. The data will be examined in relation to stocking records (locations and rates) to determine how effective stocking has been in improving salmon production on the Miramichi River over the past 30+ years. The results of this ongoing investigation will lead to an improved understanding of stocking dynamics in the Miramichi watershed and may lead to the development of best management practices in relation to Atlantic salmon stocking programs.

Ben Wallace

University of New Brunswick / Canadian Rivers Institute

Fredericton, N.B.

b.wallace@unb.ca

Coauthor: Allen Curry