PENNSYLVANIA
CHAPTER

Presents

The 2020 Technical Meeting

Aquatic Resource Restoration

February 6 – 7, 2020
Juniata College
Ellis Hall, Ballroom
Huntingdon, PA

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1876

Schedule

Thursday February 6th, 2020
Ellis Hall Ballroom

Time	Activity
7:30 – 8:00	Light breakfast, coffee, **check-in and registration** open until 1:30**, poster set up**
8:15	Welcome and introductions: Greg Moyer
8:30	**PLENARY: Dr. Jay Stauffer**, Penn State University, Aquatic Resources Restoration Case Histories: Schistosomiasis in Malaŵi; Chesapeake Logperch in Susquehanna River
	MORNING TECHNICAL SESSION: SPECIES DETECTION, MONITORING, AND STRESSORS
9:15	**Moyer et al.,** Identification of *Moxostoma* in the Susquehanna River, via DNA barcoding
9:35	****Smith et al**., Rusty Crayfish in the Juniata River watershed
9:55	****Kim et al**., Standardizing Methods for environmental DNA (eDNA) sampling in stream water
10:15	**Yergin et al.**, First report of three freshwater sponges in Western Pennsylvania (Ohio River)
10:35	BREAK (refreshments provided)
10:50	**Blakeslee and Galbraith**, Experimental investigation into the thermal biology of American eel
11:10	**Wertz**, Thermal Fish Index – A tool for monitoring and assessing fish communities
11:30	****Massie et al**., Do lake-specific characteristics mediate the temporal relationship between Walleye growth and warming water temperatures?
11:50	**Lunch (provided)**
	AFTERNOON TECHNICAL SESSION: STRESSORS (CONT.) AND RESTORATION
1:30	****McClure et al**., Maternal sourcing of contaminants from ovary to juvenile Smallmouth Bass in the Chesapeake Bay Watershed
1:50	****Parks et al.,** Diet analysis of Smallmouth Bass in the Susquehanna River
2:10	****Jeffers et el**., Comparative analysis of oxytetracyline levels in farm-raised and wild Brook Trout
2:30	****Letourneau et al**., Digital vs. Traditional Learning: Mitigating Marshes Against Sea Level Rise
2:50	**Kemp and Kemp**, Shallow behaviors on river chub nests: describing the role of a regional keystone species and an important mutualism
3:10	**Kemp et al.**, Impacts of abnormally high precipitation on headwater stream biota and function: implications for sustainable stormwater management and infrastructure
3:30	**Adams and Tryninewski**, Summary of operations and American Shad spawning tests conducted at the Conowingo Dam West Fish Lift Facility, Spring 2019
3:50	**Shirey et al.,** Subsidence Impacts to headwater streams from longwall mining of bituminous coal in Pennsylvania
4:10	**Conclusion of technical session – wrap up**
4:15	**PA AFS business meeting**
4:45	**Dinner – on your own (see options for Local Restaurants below)**
6:00 – 9:00	**Evening social and poster session (beverages and snacks provided)**

**** Eligible for Best Student Presentation award**

Friday February 7th, 2020
Workshops (Two concurrent sessions)
Session 1: 8:00 – 9:50 am; Session 2: 10:00 – 11:50 am

Time	Activity/Location
7:30 – 8:00	von Liebig Center for Science, Sill Boardroom 2075 Light breakfast/coffee & on-site registration
	METHODS AND TECHNIQUES WORKSHOPS
All workshops will be held twice at	**Begin using R workshop** Christopher Steiha – Millersville University von Liebig Center for Science, Rockwell Seminar Room 1116
8:00 – 9:50	**eDNA workshop** Meredith Bartron and Aaron Maloy – US Fish and Wildlife Service von Liebig Center for Science, Sill Boardroom 2075
	TAXA IDENTIFICATION WORKSHOPS
and	**Ephemeroptera (genus-level) ID workshop** John Jackson – Stroud Water Resource Center Brumbaugh Academic Center B205
10:00 – 11: 50	**Cyprinid ID workshop** Doug Fischer – PA Fish and Boat Commission Brumbaugh Academic Center B202

Workshop Descriptions

Begin using R workshop

Instructor: Christopher Stieha - Millersville University (Christopher.Stieha@millersville.edu)

The R programming language is free and open-source software used for everything from programming to statistics with strong support in all branches of science. In this workshop, participants will be introduced to the basics of R, such as reading in data, plotting, and implementing statistical tests, such as ANOVA and regression. Participants should bring their own laptop and install R from cran.r-project.org before attending the workshop. Although not required, you may also want to install RStudio (rstudio.com) as a friendly user interface to R. If there are any questions, please contact me.

eDNA workshop

Instructors: *Meredith Bartron and Aaron Maloy – US Fish and Wildlife Service (*meredith_bartron@fws.gov)

The application of eDNA is rapidly spreading throughout many aspects of fisheries management. Applications include detection of aquatic invasive species, rare or difficult to detect species, or for monitoring distribution of common species, eDNA results can inform management activities. Given that management action or biological impacts can be tied to eDNA results, it's important for biologists to have a general understanding of critical steps of the technique as these may impact the results and interpretation. This workshop will provide an overview of the eDNA technique, and attendees will have the opportunity to have some hands-on experience collecting eDNA samples and of the filtering process.

Ephemeroptera (genus-level) ID workshop

Instructor: John Jackson - Stroud Water Research Center (jkjackson@stroudcenter.org)

This workshop will provide a brief introduction to the identification of aquatic insects with an overview of family level taxa as needed. The workshop will focus most effort on genus-level identification of challenging taxa within the families Heptageniidae and Baetidae. Workshop facilitators will have study specimens on site; however, attendees may bring specimens from their own collections for assistance with identification, as time allows.

Cyprinid ID workshop

Instructor: Doug Fischer – PA Fish and Boat Commission (doufischer@pa.gov)

Proper identification of minnow specimens can be challenging, especially in the field. We will review diagnostic characteristics and distributions of problematic groups of species (*Notropis* spp., hybrids, and others) that occur in PA and the surrounding region. Participants are encouraged to bring preferred personal ID resources and any specimens he or she may want to evaluate.

Local Restaurants

A number of restaurants and cafes are located in the downtown area of Huntingdon along Washington and Penn Streets. We recommend considering the following:

1. Standing Stone Coffee Company; 1229 Mifflin St, Huntingdon, PA 16652
2. Boxer's Café; 410 Penn St, Huntingdon, PA 16652
3. The Wildflower Café; 516 Washington St, Huntingdon, PA 16652
4. Three Twelve Kitchen and Cocktails; 312 Penn St, Huntingdon, PA 16652
5. Woody's Bar-B-Q; 7620 Lake Raystown Shopping Center, Huntingdon, PA
6. Kelly's Korner; 1430 Pennsylvania Ave #1118, Huntingdon, PA 16652

Meeting At A Glance

Presentation Type	Time	Student	Presenting Author	Short Title	Abstract page #
PLENARY	8:30		Dr. Jay Stauffer		1
ORAL	9:15		Gregory R. Moyer	Identification of Moxostoma In the Susquehanna River, Via DNA Barcoding	2
	9:35	Y	Nicholas A. Smith	Rusty Crayfish in The Juniata River Watershed	3
	9:55	Y	Rachel Kim	Standardizing Methods for Environmental DNA (eDNA) Sampling in Stream Water	4
	10:15		Marc L. Yergin	First Report of Three Freshwater Sponges in Western Pennsylvania	5
	10:50		Carrie J. Blakeslee	Experimental Investigation into The Thermal Biology of American Eel	6
	11:10		Tim Wertz	Thermal Fish Index – A Tool for Monitoring and Assessing Fish Communities	7
	11:30	Y	Danielle L. Massie	Do Lake-Specific Characteristics Mediate the Temporal Relationship Between Walleye Growth and Warming Water Temperatures?	8
	1:30	Y	Catherine McClure	Maternal Sourcing of Contaminants from Ovary to Juvenile Smallmouth Bass In The Chesapeake Bay Watershed	9
	1:50	Y	Timothy Parks	Diet Analysis of Smallmouth Bass in The Susquehanna River	10
	2:10	Y	Roxanne Jeffers	Comparative Analysis of Oxytetracyline Levels in Farm-Raised and Wild Brook Trout	11
	2:30	Y	Stephanie Letourneau	Digital Vs. Traditional Learning: Mitigating Marshes Against Sea Level Rise	12
	2:50		Mary J. Kemp	Shallow Behaviors on River Chub Nests: Describing the Role of a Regional Keystone Species and an Important Mutualism	13
	3:10		Stanley J. Kemp	Impacts of Abnormally High Precipitation on Headwater Stream Biota and Function	14
	3:30		Steven W. Adams	Summary of Operations and American Shad Spawning Tests Conducted at The Conowingo Dam West Fish Lift Facility	15
	3:50		Patrick Shirey	Subsidence Impacts to Headwater Streams from Longwall Mining of Bituminous Coal in Pennsylvania	16
POSTER	6:00-9:00	Y	Alexandria C. Beezel	Evaluating the Utility of Otolith Microchemistry to Determine Smallmouth Bass Environmental Life History	17
		Y	Caroline Benfer	Utility of Benthic Macroinvertebrates and Fish Communities as Indicators of Agrochemical Concentrations	18
		Y	Ali Binder	Evaluation of Best Management Practices for Stream Restoration	19
		Y	Kendra C. Boyle	Investigating Water Quality and Trout Population Changes in Two Acid Mine Drainage Impaired Streams After Remediation	20
		Y	Bailey Coder	Microplastic Research in Channel Catfish	21
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		Y	Jeremy Chen See; Olivia Wright	Bacterial Biomarkers of Hydraulic Fracturing's Activity on Nearby Streams	23
		Y	Will Conrad	Gene Expression Analysis of Brook Trout Exposed to Fracking In The Marcellus Shale Region	24
		Y	Emily Dowler	Species Identification of *Salmincola edwardsii* and *S. californiensis* (Gill Lice) through DNA Sequencing	25
		Y	Laura Horowitz	Micro-friction and adhesive properties of fish	26
		Y	Amy King	Comparison of macroinvertebrate and microbial populations in decomposing nonnative *Fallopia japonica* and native riparian trees	27
		Y	Abby Sieg	Nutrient Composition and Sediment Size in Stream Sediments	28
		Y	Emily Simon	Sequence Analysis to Support Morphological Species-Level Identification of Freshwater Sponges in Western Pennsylvania	29
		Y	Nicholas A. Smith	Rusty Crayfish Impact on Smallmouth Bass and Allegheny Crayfish	30
		Y	Nicholas R. Visser	Decomposition, Microbial Priming, and Macroinvertebrate Consumption Rates of Maple and Oak Leaves	31

Plenary Speaker Bio
Dr. Jay Stauffer
Distinguished Professor of Ichthyology

Jay R. Stauffer, Jr. started studying the fishes of Lake Malaŵi in 1983. For 25 years he spent 4—8 months in Malaŵi. Over the last 37 years he has made 50+ trips to Malaŵi and was funded by the National Institutes of Health, National Science Foundation, World Wildlife Fund, USAID, among others. During this time, he attempted to use indigenous snail-eating fishes, which had reduced population numbers due to overfishing, as a biological control for schistosomiasis throughout the lake. Additionally, he is currently funded by the Pennsylvania Fish and Boat Commission to attempt to restore the native Chesapeake Logperch, *Percina bimaculatum* to areas in the Susquehanna River drainage, where it has been extirpated. His talk will summarize both projects along with successes and failures of these restoration efforts.

Oral Presentation Abstracts

*** INDICATES A STUDENT PRESENTER TO BE JUDGED**

Identification of *Moxostoma* specimens collected in the Susquehanna River, Pennsylvania via DNA barcoding

Gregory R. Moyer[a], Ryan Shaw[a], Tim Wertz[b]

[a] Mansfield University, Mansfield, PA 16933

[b] Department of Environmental Protection, Bureau of Clean Water, Harrisburg, PA, 17105

Shorthead Redhorse (*Moxostoma macrolepidotum*) is the only Redhorse species to inhabit the Susquehanna River (Stauffer et al. 2016). However, collections of specimens around the Curwensville Dam area on the West Branch of the Susquehanna were morphologically different from typical Shorthead Redhorse. To confirm the identification of these specimens, and other specimens collected from throughout the Susquehanna River, we compared the mitochondrial (mt)DNA for these specimens with mtDNA obtained from the Barcode of Life (BOLD) DNA sequence repository. We found that the mtDNA of Redhorse from the Curwensville Dam area was more similar to Golden Redhorse (*M. erythrurum*) from the Mississippi Basin than the native congener. In contrast, putative Shorthead Redhorse from other areas of the Susquehanna River were identified as Shorthead Redhorse using the same molecular marker. These findings provide evidence that Golden Redhorse now inhabit portions of the Susquehanna River.

Presenter: Gregory R. Moyer; gmoyer@mansfield.edu

Rusty Crayfish in the Juniata River Watershed

*Nicholas A. Smith[a], George T. Merovich Jr.[a], Madison Hearn[b], Vince Buonaccorsi[b]

[a] Juniata College, Fisheries and Aquatic Sciences Program, Huntingdon, PA 16652

[b] Juniata College, Department of Biology, Huntingdon, PA 16652

Understanding impacts of invasive species on an ecosystem helps determine how ecosystem services are altered. In the Juniata River system of central Pennsylvania, the Rusty crayfish (*Faxonius rusticus*) was introduced and is invasive in warmer rivers and streams. The on-going goal of our research is to understand the ecology of this species and its impacts on riverine ecosystems. The objectives of the current presentation is to update the distribution of rusty crayfish in the Juniata River system and to show preliminary results on data that was collected to investigate hybridization between rusty crayfish and Allegheny crayfish (*F. obscurus*). We visually searched for crayfish over the last 3 years in many locations within the basin, but focused mostly on the Little Juniata River sub-basin. Thus far, we have located rusty crayfish in most of the upper Juniata River watershed but they are blocked from the Raystown Branch of the Juniata River by the Raystown Lake dam. Rusty crayfish occur below the confluence of the Little Juniata and Frankstown Branches, and thus have access to these subwatersheds. Continued monitoring rusty crayfish will be critical for early detection and implementing effective management plans. To identify intermediate traits of putative interspecific hybrids, we compared over 15 different meristic and morphological features of rusty and Allegheny crayfish. Putative intermediates were also analyzed genetically to determine if introgression has occurred. We tentatively identified 8 morphological intermediates while in the field, 2 of which were genetically determined to be F1 hybrid backcrosses with rusty crayfish. We also identified a rusty crayfish in the field that was later found to be an F1 backcross. Thus, we have confirmed genetic hybridization between rusty and Allegheny crayfish, and are currently relating morphological information to these findings. Identifying potential for hybridization with invasive species is important because hybrids can be more environmentally harmful than parental lines.

Presenter: Nicholas A. Smith; smithna17@juniata.edu

Standardizing Methods for environmental DNA (eDNA) sampling in stream water: Examining the role of filter material, pore size, and water volume on brook trout eDNA recovery

*Rachel Kim[a], Christopher Rees[b], Aaron Maloy[b], Meredith Bartron[b], and Christopher Grant[a]

[a] Juniata College, Biology Department

[b] U.S. Fish and Wildlife Service Northeast Fishery Center

Freshwater organisms are particularly sensitive to environmental changes and are among the most affected species of anthropogenic activities. In recent years, the application of environmental DNA (eDNA) gained popularity as an efficient and noninvasive tool for detecting and monitoring aquatic species such as fish. While this method has allowed for qualitative analysis of detecting for species presence, emerging efforts focus on estimating biomass of target species by quantifying captured eDNA. As the utilization of eDNA is relatively new to fields of ecology and conservation biology, no standard methods exist for stream sampling of aquatic species, making comparisons between the results of eDNA studies difficult. A few studies have recognized this variability in methods and explored efficacies of diverse factors that influence eDNA detectability (e.g., filter materials and sample storage), and consensus or agreement has yet to be resulted. This study provides additional information toward standardizing method for aquatic eDNA collection to allow for more comparative results across the field. Three volumes (400 mL, 2 L, and 4 L) of stream water were sampled through 1.2 um and 5 um glass fiber (GF) and polyethersulfone (PES) filter membranes. Brook trout markers were used to examine the effects of filter materials, pore sizes, and volume of samples via real-time PCR analyses. We anticipate that the findings will provide a better understanding of the efficacies of filter types, pore sizes, and sample volumes on target eDNA recovery.

Presenter: Rachel Kim; kimyx16@juniata.edu

First Report of three freshwater sponges (Porifera: Demospongiae: Spongillidae) in Western Pennsylvania (Ohio River Watershed)

Marc L. Yergin[a], Timothy A. Pearce[a], Emily F. Simon[b]

[a] Section of Mollusks, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, PA 15213 U.S.A.

[b] Biological Sciences Department, Duquesne University, 600 Forbes Avenue, Pittsburgh, PA 15282 U.S.A.

Three species of freshwater sponges, *Ephydatia muelleri* (Lieberkun,1856), *Ephydatia fluviatilis* (Linnaeus, 1759), and *Heteromeyenia tubisperma* (Potts,1856), were collected from western Pennsylvania streams and quarry lakes from 2014 to 2019. These are the first records for these species in western Pennsylvania. All three species were found in streams with little or no silt; in addition, *E. fluviatilis* was also found in quarry lakes on substrates of various pitches but were not found on the top of horizontal surfaces. In this talk, we present a brief overview of sponges, the simplest and oldest extant metazoans. We discuss information on the environmental factors that may influence the presence of sponges and propose a hypothesis of how non-motile sponges ended up in the water in which we found them. Finally, discuss why these species records are important and how the presence of freshwater sponges could be a more sensitive indicator of water quality in Pennsylvania streams.

Presenter: Marc L. Yergin; marc.yergin@gmail.com

An experimental investigation into the thermal biology of American eel, *Anguilla rostrate*

Carrie J. Blakeslee[a] and Heather S. Galbraith[a]

[a] US Geological Survey, Leetown Science Center, Northern Appalachian Research Laboratory, Wellsboro, PA 16901

Temperature is a primary driver of biological processes in aquatic ecosystems. The thermal regimes of these systems are changing due to a variety of factors including climate change, land use change, and water management. Research scientists and managers strive to understand how these changes will impact streams and rivers investigating impacts on organisms' physiology, species distribution, and the rates of overall ecosystem processes. However basic thermal biology is lacking for many aquatic species. The American eel, *Anguilla rostrata*, is an ecologically important species declining throughout its range thought to be due in large part to migration barriers. Research on basic eel biology is limited and increased understanding would aid in their conservation and management. Scientists at the U.S. Geological Survey are conducting laboratory experiments to investigate the effects of seasonal changes and unseasonal acclimation temperatures on the physiology of American eels across its life stages. Resting metabolic rate (measured by oxygen consumption) and upper thermal tolerances (measured by critical thermal maximum) were compared for glass, elver, and yellow staged eels. Differences were observed in both oxygen consumption and critical thermal maximum across temperatures investigated and by life stage. These results provide important data in understanding how a changing thermal environment could impact American eel physiology and which life stages would be most susceptible to thermally stressful events.

Presenter: Carrie J. Blakeslee; cblakeslee@usgs.gov

Thermal Fish Index – A tool for monitoring and assessing fish communities.

Tim Wertz[a]

[a] Department of Environmental Protection, Bureau of Clean Water, Harrisburg, PA, 17105

Natural and anthropogenic variables can work independently or synergistically to influence fish assemblages. The effects of these variables on fish assemblages are measurable along a thermal gradient. A Thermal Fish Index (TFI) is a simple tool that can be used to measure these changes. Topics that will be discussed include: (1) important ecological concepts that serve as a framework (2) methods to develop a TFI (3) methods to implement and interpret a TFI. Additionally, real-world examples will be provided throughout to demonstrate the ability of a TFI to measure fish assemblage responses to degradation, restoration and global climate change.

Presenter: Tim Wertz; twertz@pa.gov

Do lake-specific characteristics mediate the temporal relationship between Walleye growth and warming water temperatures?

*Danielle L. Massie[a], Gretchen Hansen[b], Yan Li[c], and Tyler Wagner[d]

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[b] Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, 135 Skok Hall, 2003 Upper Buford Cr, St. Paul, Minnesota, 55108, USA

[c] North Carolina Division of Marine Fisheries, North Carolina Department of Environment Quality, Morehead City, North Carolina 28557

[d] U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University, 402 Forest Resources Building, University Park, Pennsylvania 16802, USA

Quantifying the drivers of spatiotemporal variability in fish growth is necessary for predicting species' response to environmental changes. In particular, it is important to understand how warming water temperatures influence growth, and whether ecosystem properties may mediate the growth-temperature relationship. A recent study found that the rate of lake warming may differ based on lake characteristics, such as lake depth, size, clarity, and sheltering from wind. Therefore, it is unclear how climate change may impact the demographics of inland fishes, and whether certain lake characteristics may mediate the effect. Our objectives were to: 1) quantify the spatiotemporal variability of Walleye *Sander vitreus* growth in Minnesota and Wisconsin inland lakes, 2) determine if annual growth coefficient estimates (*K*) are correlated with growing degree days (GDD), and 3) identify if lake characteristics (i.e., lake depth, lake area, Secchi disk depth, and lake-average GDD) are drivers of the *K*-GDD relationship. To estimate spatiotemporal growth variability, we fitted a Bayesian hierarchical von Bertalanffy growth model to Walleye length-at-age data from 1983-2015 for 61 lakes. Growth estimates varied substantially among years and lakes. On average, we found GDD was significantly and positively correlated with *K* estimates; however, this relationship varied in direction and magnitude among lakes. We estimate a 93% posterior probability of a negative effect of Secchi disk depth on the *K*-GDD relationship, suggesting that water clarity may mediate the effect of warming water temperatures. Additionally, we found that Walleye growth, on average, was significantly greater in larger lakes. Our results provide insights into the conservation of cool-water species subjected to a changing environment, as well as, help managers and conservationists identify locations in which Walleye are most resilient to climate change.

Presenter: Danielle L. Massie; daniellelmassie@gmail.com

Maternal sourcing of contaminants from ovary to juvenile Smallmouth Bass in the Chesapeake Bay Watershed

*Catherine McClure[a], Kelly Smalling[b], Vicki Blazer[c], Tyler Wagner[d]

[a] Pennsylvania Cooperative Fish and Wildlife Research Unit, Department of Ecosystem Science and Management, 413 Forest Resource Building, The Pennsylvania State University, University Park, PA 16802 USA

[b] U.S. Geological Survey, New Jersey Water Science Center, 3450 Princeton Pike, Suite 110, Lawrenceville, NJ, USA

[c] U.S. Geological Survey, Fish Health Branch, Leetown Science Center, 11649 Leetown Road, Kearneysville, WV 25430 USA

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The ubiquitous nature of chemical contaminants in freshwater ecosystems poses a threat to fish health. Although direct exposure through the water column is a critical exposure pathway, less is known about the potential for maternal sourcing of contaminants to offspring. Investigating this potential exposure pathway is important due to a growing concern over the potential impacts of contaminants on smallmouth bass populations within the Chesapeake Bay Watershed. Specifically, there is evidence of intersex and immunosuppression within local populations potentially due to exposure to chemical compounds. To better understand the potential of maternal sourcing, tissues samples were taken in 2015 across eight river sites from smallmouth bass ovaries and young of the year. Several classes of contaminants were quantified including polychlorinated biphenyls (PCBs), organochlorine pesticides and wastewater indicator compounds such as fragrances, polycyclic aromatic hydrocarbons, pesticides and flame retardants. We will present preliminary results evaluating the potential contribution of maternally derived chemicals on offspring contaminant loads across sites within the Chesapeake Bay Watershed as well as discuss the implications for fish health and management.

Presenter: Catherine McClure; cmm1148@psu.edu

Diet analysis of Smallmouth Bass in the Susquehanna River

*Timothy Parks[a], Thomas C. Bluj[a], Matt Wilson[a], and Dr. Jonathan M. Niles[a]

[a] Susquehanna University

Microplastics are an emerging concern in freshwater systems for many organisms, and the presence of them may impact the biological function of freshwater fish. A diet analysis was performed on Smallmouth Bass (*Micropterus dolomieu*) and they were tested for the presence of microplastics (plastic particles <5 mm). Two hundred and six Smallmouth Bass stomachs were collected between 2017 and 2019 from the Susquehanna River and a tributary known as Pine Creek. The diet analysis of Smallmouth Bass shows a large variety of prey items from several trophic levels suggesting that there are many pathways for the accumulation of microplastics. The primary diet item in 2017 and 2019 was crayfish (53.8% and 46% respectively). In 2018 it was macroinvertebrates (39.5%). Analysis for the presence of microplastics using the wet peroxide oxidation procedure found that microplastics were present in the diets at varying rates each year. In 2018, microplastics were present in 95.5% of the fish sampled. In 2017, 87.5% of the fish sampled contained microplastics. The average number of microplastics per fish varied per year with the samples from 2019 having 28.9 microplastics per fish, 2018 had 6.1, and in 2017 there was an average of 2.3 microplastics per fish. One possibility for the differing number of microplastics could be the flow rate of the Susquehanna River, allowing it to gather more plastic waste and break it down with a higher flow rate. In 2019 the average flow has been 50,083 ft3/second, in 2018 it was 49,950 ft3/second, in 2017 the average was 31,070 ft3/second (USGS water flow data for Susquehanna River at Sunbury PA). Our study will help increase the knowledge of what Smallmouth Bass consume in their diet and the presence and concentration of microplastics in freshwater fish species found in the Susquehanna River.

Presenter: Timothy Parks; Parkst@susqu.edu

Comparative analysis of Oxytetracyline levels in Farm-Raised and Wild Brook Trout (*Salvelinus fontinalis*)

*Roxanne Jeffers[a] and Dr. Chris Grant[a]

[a] Juniata College, Biology Department

Antibiotics are widely used in the medical and agricultural industry and are speculated to persist in the environment. They are heavily used in aquaculture, one of the fastest growing segments of U.S agriculture, with the Pennsylvania Fish and Boat Commission raising and releasing nearly 5 million hatchery raised trout across the state. Oxytetracycline is the most commonly used antibiotic to treat bacterial infections in fish. We sampled six streams to collect 9 stocked trout and 12 native trout. We utilized ELISA to compare oxytetracycline concentration levels of the kidney, liver and muscle tissue between Farm-Raised and Freshwater Brook trout. Preliminary results show higher levels of oxytetracycline in Wild Brook Trout than Farm-Raised Trout. This research is of utmost importance because very little research has been done on antibiotic levels in trout. Continuous presence of antibiotics even at low concentrations can lead to development of resistant substrains of bacteria. This has direct implications on the resistance status of bacterial populations in streams where human populations may come into contact with them.

Presenter: Roxanne Jeffers; jefferk16@juniata.edu

Digital vs. Traditional Learning: Mitigating Marshes Against Sea Level Rise

*Stephanie Letourneau[a, b], Sarah Nuss[a], Scott Lerberg[a]

[a] Chesapeake Bay National Estuarine Research Reserve in Virginia

[b] Juniata College

It can be problematic to engage students in science because some concepts are difficult for students to visualize. One way of alleviating this issue includes using authentic research from scientists, allowing students to explore real-world situations. With the advancement of digital technology tools, teachers are beginning to implement digital learning to aid classroom instruction and the student learning process. Esri Story Maps is an evolving tool that allows end users to explore a topic through images, videos, interactive maps, data, figures, and text. This platform is accessible for educators, researchers, industry professionals, and even students. The objective of the study was to compare perspectives of translating science through traditional learning versus digital learning. For this project, current research focused on a thin-layer placement marsh restoration technique experiment in the National Estuarine Research Reserve System (NERRS) was translated into a lesson plan and Story Map. In addition, a series of short interviews with teachers and students were conducted to understand their perspectives on digital learning. Those same teachers were then provided an opportunity to evaluate the two learning tools and both tools were tested with high school students attending a summer camp at Chesapeake Bay NERR in Virginia. This study outlines the difficulties with utilizing technology in the classroom, but it also highlights the benefits when used in a strategic manner. By better understanding student and teacher perspectives on digital learning, we are able to provide useful resources to assist teachers in quality science education.

Presenter: Stephanie Letourneau; letousm16@juniata.edu

Shallow behaviors on river chub nests: describing the role of a regional keystone species and an important mutualism

Mary J. Kemp[a, b] and Stanley J. Kemp[b]

[a] Nolde Forest Environmental Education Center, Reading, PA 19607

[b] University of Baltimore, 1420 N. Charles St. Baltimore, MD 21201

River chub (*Nocomis micropogon*) and related species fill a keystone species role in native freshwater fish communities of Pennsylvania. They accomplish this through constructing nesting habitat which are used by other species of fish. Multiple studies have shown them to be vulnerable to high levels of urbanization by being reduced or absent in these areas. Since 2013, we have conducted studies on the nesting activity, ecology and behavior of river chub in NE Maryland, including nesting aggregations of multiple species on river chub nests. The primary goals of this continuing study are to better understand the impacts urbanization has on this important species, monitor key populations, better understand the community role filled by river chub, and their interactions with other species. In this paper, findings of our research on the behavior of river chub from analysis of underwater video are summarized, along with possible implications for species habitat protection and restoration. Over the years 2015-2019, segments of 55 active nesting aggregations on river chub nests were filmed and analyzed. Specifically, the nature of the interspecific mutualism has been shown to be complex. Agonistic interactions both between and within species have been documented through analysis of individual focals. Also, cues related to undescribed pigment signaling and sound generation may be important for river chub and nest associates. Future research plans are outlined and potential implications for conservation and protection of these species are discussed.

Presenter: Mary J. Kemp; jillkempriver@gmail.com

Impacts of abnormally high precipitation on headwater stream biota and function: implications for sustainable stormwater management and infrastructure

Stanley J. Kemp[a], Andrea Welker[b], Lesmes A. Mora Jerez[b], James Kugel[b], Emily Carambelas[b]

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Abstract

Restoration and protection of water resources and the ecosystem services they provide depends critically on the healthy function of tributary streams. Headwater streams constitute a great majority of stream miles in freshwater networks, and influence the quality of larger downstream resources through regulation of water quality (e.g. nutrients and sediment, discharge levels) and maintenance of biodiversity. However, due to their small size they have often been overlooked in terms of protection, and are vulnerable to disturbance. Increasing pressure from development and redevelopment, as well as the predicted long- term impact of climate change, calls the adequacy of existing protections for these streams into question. We have monitored physical, chemical, and biological stream functions at four streams (Chrome Run, Dismal Run, Rocky Run, and Dicks Run) since 2016 in Delaware County, PA. An unprecedented year (2018- 2019) of record- breaking precipitation has provided a possible preview of the warmer and wetter conditions predicted by climate change scientists, in the context of urbanized southeastern Pennsylvania. During 2018- 2019, people living along Chrome Run experienced dangerous levels of flooding, property damage, and hazardous conditions. Impacts on stream biota were most pronounced on sensitive fish (i.e. brown trout, cutlips minnow and tessellated darter) and invertebrates (i.e. EPT taxa), according to respective long term and year over year (YOY) analyses. Generally speaking, impacts were most evident at the highest quality sites monitored, and on sensitive taxa. Protection and restoration measures, adequacy of infrastructure, and other challenges will be discussed in light of increased precipitation scenarios.

Presenter: Stanley J. Kemp; skemp@ubalt.edu

Summary of Operations and American shad Spawning tests conducted at the Conowingo Dam West Fish Lift Facility, Spring 2019

Steven W. Adams[a] and Joshua D. Tryninewski[b]
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Since its operation began in 1972, the West Fish Lift (WFL) at Conowingo Dam has been an integral part of a cooperative effort to restore American Shad (*Alosa sapidissima*) to the Susquehanna River. Initial operations focused on monitoring abundance of adult shad as they encountered the Conowingo Dam during their spring spawning migration. Later, the WFL trapped adult shad for transplantation to open river spawning habitat above migration barriers (1982-1997). With the completion of fish passage at Conowingo Dam (1991), Holtwood and Safe Harbor dams (1997), and a fish ladder at York Haven Dam (2000), the role of the WFL changed. Beginning in 2001, the primary goal of the WFL has been the collection of American Shad brood fish for tank spawning and the production of fertilized eggs to support the Pennsylvania Fish and Boat Commission's (PFBC) hatchery operation and restoration stocking efforts throughout the Susquehanna Basin.

The WFL operated for 20 days between May 1 and May 31. A total of 227 lifts were conducted over some 124 hours of fishing time. A total of 227,724 fish of 31 species were collected and identified. Nearly 99% of the catch was comprised of Gizzard Shad (*Dorosoma cepedianum*) (220,110), Channel Catfish (*Ictalurus punctatus)* (3,136), and Common Carp (*Cyprinus carpio*) (1,128). American Shad catch totaled 390 (185 males, 178 females) with the largest daily catch occurring on the first day of operation, May 1 (132).

Tank spawning was conducted in a 3m round tank (6,400L volume) and supplied with a continuous 95-117L/min flow of river water. Five hormone-induced spawning trials were conducted with 274 American Shad (146 males, 128 females). Each spawning trial lasted 48hrs with the greatest volume of eggs being released 36-40 hours after hormone injection. Fertilized eggs were collected from the spawning tank effluent water via a 3m long insulated trough tank (1135L volume) equipped with a screen and bubble curtain near the standpipe-controlled drain. Following each spawning trial, eggs were carefully netted from the tank, sieved and rinsed through a colander, and gathered in a graduated 3L pitcher with screen mesh bottom to measure egg volumes and facilitate packaging for transport. To bolster egg production, attempts were made following each spawning trial to hand strip eggs from all running ripe female American Shad and fertilize with ripe males.

Tank spawning trials produced 27.75L of eggs (~1,195,000 eggs), while an additional 5.43L of eggs (~277,000 eggs) were collected from strip-spawning efforts. In 2019, a total of 33.18L of eggs were collected from tank spawning operations at the WFL. All eggs were delivered to the PFBC Van Dyke Hatchery for larval shad culture and stocking. The overall estimated viability (or percent of eggs that hatch) was 45.2% and yielded more than 665,000 live eggs.

Presenter: Steven W. Adams; sadams@normandeau.com

Subsidence Impacts to Headwater Streams from Longwall Mining of Bituminous Coal in Pennsylvania

Patrick Shirey[a], Andrea Kautz[b], Robert Winn[a,b], Taylor DaCanal[a], Jared Deglmann[a], Marja Copeland[a], Stephen Tonsor[b], Anthony Iannacchione[a], and Daniel Bain[a]

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Longwall mining of bituminous coal causes surface subsidence. As a result, the substrate of some streams is fractured (cracks in substrate) or heaved (lifting of substrate). When subsidence causes fractures or heaves, stream flow can be lost to subsurface flow. In Pennsylvania, mine operators are required to augment streams. Other states with longwall mining don't have the same level of protection for restoring stream flow after mining. Pennsylvania protects ephemeral streams under its Clean Streams Law and mining regulations, though the state has also relied on federal jurisdictional determinations for streams and wetlands by the U.S. Army Corps of Engineers. Even in Pennsylvania, restoration of flow is not always successful, and some headwater streams don't fully recover after mining. Consequently, perennial streams can become ephemeral or intermittent. So, in effect, under the revised definition of Waters of the United States (WOTUS), perennial streams could be removed from federal jurisdiction by a legal activity (longwall mining) that reduces stream flow. Hypothetically, under the revised rule, someone could then fill these former perennial streams without needing to obtain a federal permit. These impacts and implications will be synthesized to estimate the broad implications of mine subsidence to the WOTUS rule change.

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Poster Abstracts
Presented by authors last name, alphabetically
*** INDICATES A STUDENT PRESENTER TO BE JUDGED**

Evaluating the Utility of Otolith Microchemistry to Determine Smallmouth Bass Environmental Life History Throughout the Susquehanna River Basin

*Alexandria C. Beezel[a], Quinton E. Phelps[a], Megan Kepler Schall[b], Geoffrey Smith[c], Vicki Blazer[d], Tyler Wagner[e]

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The Susquehanna River, previously noted as being one of the most imperiled rivers in the United States, has been of great interest in terms of ecological restoration efforts in recent years. The Smallmouth Bass is a popular and locally economically important recreational fishery in the Susquehanna River. Smallmouth Bass have exhibited disease and population changes including periods of decline since 2005. These recent disease-related mortality events and population fluctuations lead to an increased focus on fish health, contaminant exposure, and various aspects of life history and ontogeny. Previous studies using radio telemetry suggest that Smallmouth Bass utilize habitats in both the main-stem river and tributaries. However, minimal information exists as it relates to movement during early life history and how main-stem river and tributary spawned fish contribute to the larger population. Understanding more during this critical life stage may provide insight into the aforementioned declines and differential exposure to environmental stressors (e.g., contaminant and pathogen exposure) Because telemetry is not feasible for early life stages in Smallmouth bass, we sought to determine the feasibility of using otolith microchemistry to determine the environmental life history strategy of Smallmouth Bass in the Susquehanna River. Naturally occuring chemical markers in otoliths have shown to be a useful tool in describing environmental life history of numerous fishes in various environments. Laser ablation of individual otoliths was used to obtain Strontium (Sr86) to Calcium (Ca43) ratios for respective Smallmouth Bass samples from river and tributary sites in the Susquehanna River Basin. Different elemental signatures in otoliths were documented indicating fish may be moving and inhabiting different sites throughout their life. However, current data does not allow for identifying a specific main-stem reach or tributary. Further analyses of the otolith chemistry coupled with water chemistry will allow assignment of specific location these individuals. The continuation of this study and the information garnered will allow us to construct a database that will be valuable in directing future adaptive management schemes for the recovery of Smallmouth Bass in the Susquehanna River.

Presenter: Alexandria C. Beezel; Alexandria27@live.missouristate.edu

Utility of benthic macroinvertebrates and fish communities as indicators of agrochemical concentrations in the Standing Stone Creek watershed

*Caroline Benfer[a], Benjamin Haussmann[a], Seth Strawser[a] and Dr. Christopher Grant[a]

[a] Juniata College Department of Biology

Benthic macroinvertebrates and fish communities are known to convey the chemical and physical characteristics of a stream ecosystem. Macroinvertebrates and fish communities make good long-term indicators of basic stream physiochemical properties such as pH, temperature, nitrates, and fecal coliform. Fish and macroinvertebrates both play a critical role in aquatic communities, their abilities to move and adapt to different environments based on changing conditions, and the way in which their diversity and abundance portray these characteristics. While this is well established, little is known as to whether these communities and measures of their biodiversity can be used as indicators of endocrine disrupting chemical-linked agrochemicals. Endocrine disrupting chemicals (EDC) are those chemicals that can interfere with endocrine systems at certain doses. These disruptions can cause cancerous tumors, birth defects, and other developmental disorders. The EDC's of greatest concern for this project included agrochemicals such as acetochlor, atrazine, desethylatrazine (DEA), metolachlor, prometon, and simazine. Atrazine was banned in the European Union in 2004, when the EU found groundwater levels exceeding the limits set by regulators and data could not show that these levels were safe for consumption of any kind. This project will look at how EDC's and agrochemicals will affect the fish and macroinvertebrate populations, in past studies these chemicals have affected them negatively and this trend is thought to stay the same.

Presenter: Caroline Benfer; benfece17@juniata.edu

Evaluation of Best Management Practices For Stream Restoration Projects

*Ali Binder [a], Abby Sieg [a], Kaitlyn Gardineer [a], Adrienne Gemberling [a], Matt Wilson [a], Dr. Daniel Ressler [a]

[a] Susquehanna University

Best Management Practices (BMPs) are often used to describe acceptable practices that could be implemented to protect water quality and promote soil conservation at any particular location. Toe logs, cross vanes, and riparian plantings are just a few of the many possible BMPs used in stream restoration projects to anchor bank sediments, control the direction of water flow, re-establish riffles and pools, and improve the overall aquatic habitat. Seven impaired sites with implemented BMPs across four Pennsylvania counties were electro-shocked for fish populations. By comparing the differences in fish population data in years before and after the installation of BMPs, conclusions can be drawn about the effectiveness of those BMPs. It is expected that the streams with a greater quantity of BMPs installed would result in healthier, more abundant, fish populations. The goal of this research is to gain an understanding of which BMPs are most effective in improving fish habitat and then use this information to create a ranking of BMPs or BMP categories in order to guide restoration managers toward the most effective techniques for the site-specific conditions.

Presenter: Ali Binder; bindera@susqu.edu

Investigating water quality and trout population changes in two acid mine drainage impaired streams after remediation

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Acid mine drainage (AMD) impairs streams throughout the state of Pennsylvania resulting in acidic stream conditions, toxic metals, and metal precipitates. Streams impaired by AMD represent important lost habitat for many species of conservation need in Pennsylvania including our state fish, the brook trout (*Salvelinus fontinalis*). Cooks Run and its tributaries, Rock and Camp runs located in Clinton County, Pennsylvania are wild trout streams impaired by AMD. In the late 1970s, a mining operation resulted in the impairment of over five miles of streams in Rock and Camp runs and Cooks Run, proper, eliminating fish populations. Remediation techniques have been tested over the years with little success leading to a more recent approach (2018-2019) to neutralize the AMD source through remining and source abatement. Between 1978-2019 water quality data (pH, total aluminum, total iron) and brook trout biomass data were collected at multiple points in time for Camp and Rock runs above and below mine discharges. Surface water samples were collected and sent to state approved laboratories, and brook trout were collected using backpack electrofishing in one-pass, 100-meter sections. Recent data demonstrated improvements in water quality below mine discharges including increasing pH levels, and declining concentrations of total iron and aluminum. During 2019 fish collections, one brook trout was collected below the AMD discharge point on one of the tributaries in an area previously uninhabited by trout. Yet, limited sampling (one season) and sample sizes (one fish) warrant future investigation and monitoring to evaluate potential trout recovery. In addition to trout and water quality monitoring, benthic macroinvertebrate samples have been collected to further evaluate remediation efforts. Future monitoring will help evaluate the success of remining and source abatement as a remediation technique for this site and provide insight for consideration of this technique for use elsewhere.

Presenter: Kendra.C. Boyle; kzb39@psu.edu

Microplastic Research in Channel Catfish

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Microplastics have emerged as a major concern in aquatic ecosystems. The scientific community has compiled substantial evidence that microplastics can impact individual species of marine mammals and fish, as well as cause disruption to food webs. While the presence of plastics and microplastics in marine systems is well documented, new research has shown that microplastics are now of emerging concern in freshwater ecosystems. Recent studies from the Susquehanna River have found the presence of microplastics in 83% of Smallmouth Bass stomachs. In order to determine whether microplastics are a threat to other fish species in the drainage, a dietary analysis will be performed on Channel Catfish collected from several sites on the Juniata River (Pennsylvania, USA). Five sites were selected based on access and depth, ranging as far upriver as Granville and as far downstream as Newport and covering approximately 40 miles of the river. Channel Catfish were specifically chosen due to their unique, highly variable diet and extremely acidic stomach. The stomachs of 68 individuals will be tested for evidence of the accumulation of microplastics. Stomach contents will be digested using a via the wet peroxide oxidation procedure. Our study will continue to provide new information about the presence of microplastics in an important benthic fish species of the Susquehanna River, and may give insight into the potential pathways of microplastic accumulation in freshwater systems.

Presenter: Bailey Coder; coder@susqu.edu

Competitive Interactions Between Creek Chub (*Semotilus atromaculatus*) and Brook Trout (*Salvelinus fontinalis*) Under the Influence of Rising Temperatures

*Bryan Colby [a], Matthew Wilson [a], Matthew Persons [a], and Jonathan Niles [a]

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The natural distribution of many freshwater fish species is limited by their thermal tolerances, both because a species cannot inhabit an area outside its tolerance range and because of increased stress when in environments approaching the limits of its tolerance range. Many species may mediate temperature change physiologically, behaviorally, or both but these changes often may alter or compromise interspecific dynamics through effects on feeding behavior, growth rate, immune responses, and social behavior. In central Pennsylvania, the Creek Chub (*Semotilus atromaculatus*) is found in both warm water streams and cold water streams, the latter of which is also home to Brook Trout (*Salvelinus fontinalis*). Brook Trout have a lower tolerance for warmer temperatures than Creek Chubs, and require higher oxygen concentrations which decreases in warmer waters. As the temperatures of waterways continue to increase due to anthropogenic climate change and land use, Brook Trout are hypothesized to be under more thermal stress which may negatively affect their ability to compete with Creek Chubs. Therefore it is important to understand the nature of these interactions so that fisheries can be managed properly as stream temperatures rise. The purpose of this study is to examine the influences that temperature has on competitive interactions between these species by are observing feeding behavior, aggression, and space use differences at three different temperatures (16, 18, and 20o C) among dyad pairs for all combinations of species (Brook Trout/Brook Trout, Brook Trout/Creek Chub, Creek Chub/Creek Chub). We are using a within-between subjects experimental design with three species combination dyads being tested at three temperatures. In this experiment, we expect that with increasing temperatures, Creek Chubs will gain competitive advantages over Brook Trout. We predict that Creek Chubs will show lower feeding latencies and eat more than Brook Trout at higher temperatures. We also predict that Creek Chubs will interfere with Brook Trout feeding more at higher temperatures through increased aggression, intimidation, and spatial displacement of Brook Trout. Based on pilot data, we also expect an increase in exploitative competition, with Creek Chubs eating more food and having a higher feeding rate with increasing temperatures. In order to prepare for the future fisheries must be managed with these expected results in mind, as they reduce the ability of the Pennsylvania native Brook Trout to compete with other species for space and food.

Presenter: Bryan Colby; colbyb@susqu.edu

Bacterial Biomarkers of Hydraulic Fracturing's Activity on Nearby Streams

*Jeremy Chen See[a], Olivia Wright[a], Nikea Ulrich[a], Hephzibah Nwanosike[a], Christopher McLimans[a], Vasily Tokarev[a], Justin R. Wright[a], Maria Campa[b], Terry Hazen[b], Christopher Grant[a], Jonathan Niles[c], Sheridan Brewer[b], Regina Lamendella[a]

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Hydraulic fracturing (fracking) has continued to become more prevalent due to its use in natural gas extraction. This is especially relevant to Pennsylvania, as it produced over 10 times as much natural gas in 2018 compared to 2010. However, fracking's impact on surrounding environments is still relatively unknown. Headwater streams are one very important environment, and, like other ecosystems, these streams contain bacteria, which respond rapidly to disturbances. Therefore, if hydraulic fracturing activity impacts nearby streams, it would be expected to alter their bacterial communities. Consequently, we decided to investigate whether fracking impacts nearby streams by examining the composition and functional capabilities of bacteria in those streams. To do that, we collected sediment samples from streams that were near hydraulic fracturing (n=9) and streams that were not near fracking (n=3). After collection, RNA was extracted from sediments and sent to the Joint Genome Institute for sequencing. Data were then analyzed using several programs, principally HUMAnN2, Qiime 1.9.1, and R. These analyses revealed a variety of functional and compositional differences among the bacterial communities. Notably, multiple pathways relating to stress response were more abundant in streams near fracking activity, indicating those streams had been impacted. Still, this project had a small sample size. Therefore, this past summer, additional samples were collected for a follow-up project, with both samples upstream and downstream of fracking activity included, to better account for differences due to geographic variation. Overall, this project, as well as the follow-up project, will help elucidate hydraulic fracturing's impact on nearby streams, which could be used to inform future regulations on this growing industry.

Presenters: Jeremy Chen See and Olivia Wright; chensjr16@juniata.edu

Gene Expression Analysis of Brook Trout Exposed to Fracking In The Marcellus Shale Region

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The introduction of fracking as a method of oil and natural gas production has made it possible for oil companies to remove massive amounts of crude oil and natural gas from areas that would previously have been prohibitively expensive to extract. The obvious risks of environmental damage and bioaccumulation of the heavy metals frequently found in fracking chemical mixtures have led to some concern among ecologists, and a push to examine the effects of fracking exposure on wildlife. Over the course of this project, we utilized transcriptomics data to analyze the correlation between gene expression and brook trout exposure to various environmental factors associated with stream fracking exposure. The transcriptome data was generated from fish taken from a series of streams in July of 2015, along with several years of water quality data measures taken for those same streams for several years prior to the fish collection. The data was analyzed in R via the Weighted Gene Coexpression Network Analysis method, which works by clustering the transcript reads into a series of modules and comparing the overall expression of the modules against a set of traits or environmental factors. In our preliminary results we found that there was a significant correlation between the gene expression of some modules and exposure to mercury in 2014, and an even stronger set of correlations between some modules and a set of water quality measures associated with fracking in 2015.

Presenter: Will Conrad; conraws16@juniata.edu

Species Identification of *Salmincola edwardsii* and *S. californiensis* (Gill Lice) through DNA Sequencing

*Emily Dowler[a], Lavinia Unverdorben[a], Dr. Vincent Buonaccorsi[a], Dr. Christopher Grant[a]

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Gill lice have spread throughout the US and threaten wild trout populations. Gill lice are parasitic copepods that attach primarily to the gills of fish, though they may also attach to the operculum and fins. The presence of gill lice decreases gas exchange and fish growth, negatively effecting overall fitness. Lice may also compound other environmental stressors (increased water temperatures) on trout populations. *Salmincola edwardsii* and *S. californiensis* are two species of gill lice that commonly infect Rainbow Trout and Brook Trout as well as other salmonid species in the US. Characterizing the occurrence of *Salmincola edwardsii* and *S. californiensis* in Wisconsin and Pennsylvania will inform decisions about combatting gill lice spread and aid in the conservation of wild trout. Gill lice species identification was determined by comparison of 28S rRNA gene sequences to data from previous phylogenetic studies. PCR was used to amplify the 28S rRNA gene and DNA sequencing was performed. Sequencing results determined that PA gill lice originated from recent introductions from another locale. Sequencing results suggested that the 28S rRNA gene is too conserved to differentiate between individuals at the species level and that a less conserved gene is required. Primers were designed from the edges of highly conserved exons spanning five ideal introns using a cDNA transcriptome. Sequencing will follow the optimization of PCR and three individuals from two populations (WI and PA) will be assessed at ten conserved loci.

Presenter: Emily Dowler; dowleem17@juniata.edu

Micro-friction and adhesive properties of fish scales – a test between predator and prey

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Aquatic organisms have evolved a diverse array of morphological and behavioral adaptations to reduce drag in their associated environments. While most studies have addressed the influence of secreted materials, anatomical features, and behavioral patterns, few have considered frictional differences between scale surface of fish predators and prey. From a co-evolutionary perspective, predators (at least in terrestrial systems) have higher muscle power, are faster, and have a greater capacity to accelerate and decelerate than their prey. Thus, we expect differences in frictional properties of fish scales between predator and prey fish species. To test this hypothesis, we collected fish scales from three differing predators species – Largemouth Bass, Smallmouth Bass, and Yellow Perch (n = 9, three individual scales per fish species). Likewise, we collected the same number of scales from three differing prey species - Common Carp, Bluegill Sunfish, and Gizzard Shad. We then estimated each scale's coefficient of friction and several adhesive properties using an Atomic Force Microscope. Preliminary results suggest that there are differences in scale adhesive properties between predator and prey fish species

Presenter: Laura Horowitz; horowitzlb22@mansfield.edu

Comparison of macroinvertebrate and microbial populations in decomposing nonnative *Fallopia japonica* and native riparian trees of the Delaware River

*****Amy King[a,b,c], Jeanne Kagle[a], Gregory Moyer[a]

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Japanese knotweed (*Fallopia japonica*) is an invasive plant of the Delaware River basin. It grows at an alarming rate outcompeting native plant species. Of interest to aquatic ecologist is how changes in allochthonous material (invasive vs native) may influence microbial and aquatic communities. While studies have shown no significant change in macroinvertebrate diversity to this new invader, little is known about alterations to the aquatic microbial community. Using leaf packs, we explored the influence of invasive allochthonous material on aquatic macroinvertebrate and microbial diversity in the Delaware River basin. Specifically, we placed leaf packs in the Delaware River that comprised of one of the following treatments: leaves from Japanese knotweed (non-native), native leaves, and a mixture of native and non-native leaves. There were 14 replicates per treatment. Leaf packs were left in the system for 40 days, where we then subsampled each leaf pack for microbial activity, and then preserved each pack in 100% ethanol. We identified macroinvertebrates to order and functional feeding group, and classified microorganisms as cellulytic/non-cellulytic using standard microbiology procedures. While data are still preliminary, we found no difference in macroinvertebrate and microbial diversity among treatments. Our results indicate that invasive allochthonous material does not influence aquatic macro and micro organismal functional groups in the confines of this study.

Presenter: Amy King; kingan13@mansfield.edu

Nutrient Composition and Sediment Size in Stream Sediments

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Precision conservation is using geospatial analysis of high-resolution datasets to determine the location where restoration will be the most effective based on elements like stream location, watershed size, and neighboring land use. For four years, Susquehanna University has worked with the Chesapeake Conservancy to study the effects of stream restoration throughout nine different watersheds in Centre, Montour, Union, and Northumberland counties. Sites are monitored before and after stream restoration has been implemented to determine the effects of restoration and best management practices on factors such as species diversity, fish populations, water quality, mean grain size of sediments, and nutrient concentrations in stream sediment. At each site, a one hundred-meter reach is electroshocked for fish, and five sediment samples are taken from a pool, riffle, eddy, a run from pool to a riffle, and a run from a riffle to a pool. The sediment samples were analyzed for grain size and nutrient concentrations, including ammonia, nitrate, and phosphate. Stream restoration should help improve stream quality by reducing erosion and the amount of fine sediments entering the stream. It was found that as mean grain size of sediments decreased, nitrate and ammonia concentrations increased, while phosphate concentrations showed no significant correlations to grain size. Increasing amounts of clay, silt, and ammonia in sediment samples also correlated to heavily agriculturally impacted streams. By studying nutrient concentrations and their correlation to mean grain size, we hope to demonstrate that best management practices can improve both fish and macroinvertebrate habitat and reduce the potential nutrient storage in the stream channel sediments.

Presenter: Abby Sieg; siega@susqu.edu

Sequence Analysis to Support Morphological Species-level Identification of Freshwater Sponges in Western Pennsylvania

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Freshwater sponges perform numerous essential environmental roles, including the ability to serve as bioindicators of water quality. While 31 freshwater sponge species have been detected across North America, documentation of freshwater species within western Pennsylvania is limited. From our collections conducted in local waters from 2015-2019, we report the presence of three freshwater sponge species, identified as *Ephydatia muelleri*, *Ephydatia fluviatilis,* and *Heteromeyenia tubisperma*. These species were identified and differentiated based on the morphology of spicules- tiny crystalline skeletal structures that support the structure of the sponges and protect them from predation. While these spicules show subtle differences in morphology between species, morphological identification can be subjective and confounded by variation in spicule traits. Furthermore, ambiguity in classification is prevalent, especially in closely related sister species, due to similarity of spicule morphology and a lack of morphological reference samples. In order to support morphological identifications, we isolated genomic DNA from our freshwater sponge samples and used PCR to amplify and sequence a 660bp hyper-variable region of the mitochondrial cytochrome oxidase I (COI) gene. Alignment of contigs to reference sequences from GenBank of *E. muelleri* and *E. fluviatilis* reveals seven variable sites among the sequences. While only two DNA sites appear to be potentially species-diagnostic between the two *Ephydatia* species, these may be sufficient to discriminate between the congeners. Sequence obtained from *Heteromeyenia tubisperma* revealed five variable sites between it and the *Ephydatia* species, but no GenBank reference sequences were available for *H. tubisperma*. The short variable sequence amplified with these mitochondrial COI primers appears to be a promising sequence region to support morphological identifications, and might also be useful as a generalized metabarcoding primer for detecting and identifying freshwater sponges from environmental DNA water samples.

Presenter: Emily Simon; simone1@duq.edu

Rusty Crayfish Impact on Smallmouth Bass and Allegheny Crayfish

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Understanding invasive species provides great insight into not just what they are, but also how detrimental they can be to native species. The rusty crayfish (*Faxonius rusticus*) is native to the Ohio River basin, however, the crayfish species has begun to overtake local waterways in and around Huntingdon county, Pennsylvania, pushing out the Allegheny crayfish (*F. obscurus*). Along with impacting native crayfish species, we are also researching the impacts rusty crayfish are having on the diets of young-of-the-year (YOY) smallmouth bass (*Micropterus dolomieu*). Young-of-the-year smallmouth bass grow in waters similar to that inhabited by rusty crayfish, and it makes sense that they may be competing for food. To study this, we have collected both YOY smallmouth bass and rusty crayfish from multiple sites along both the Juniata River and Standing Stone Creek, a tributary to the Juniata River. In total, we collected and extracted diets from 65 YOY smallmouth bass and 61 rusty crayfish from 3 different sites. All collections of smallmouth bass and rusty crayfish were made relatively close together to ensure the diets collected would be comparable. The diet contents were then examined and any macroinvertebrates found were identified. We struggled to identify stomach contents in the rusty crayfish as we were only able to identify a small amount of macroinvertebrates throughout the 61 diets. However, we were much more successful identifying stomach contents of YOY smallmouth bass, allowing us to find preliminary results into similarities between the diets. More study is needed to improve crayfish diet characterization to understand its effect on ecosystem trophic dynamics.

Presenter: Nicholas A. Smith; smithna17@juniata.edu

Decomposition, microbial priming, and macroinvertebrate consumption rates of maple and oak leaves in agricultural and forested stream microcosms

*Nicholas R. Visser[a], Jonathan M. Niles[a], and Matthew J. Wilson[a]

[a] Susquehanna University

As a secondary producer, macroinvertebrates are an essential part of any healthy stream ecosystem and vital in restoration projects as a food resource for secondary consumers like fish. Macroinvertebrates are also used as indicator taxa for stream health because they can only survive in specific conditions. We will compare the diet preference and assimilation efficiencies of macroinvertebrates between agricultural streams and forested streams to see if macroinvertebrates benefit more from slow decomposing leaves (Quercus) or fast decomposing leaves (Acer) at different densities. We will conduct a three-week lab study at the Susquehanna University Freshwater Research Institute using a 30L bench top multi-chambered experimental tank system (Pentair Aquatic Systems). Water will be obtained from a forested stream to prime the leaves. Each tank will have one of the five increasing densities of slow decomposing leaves and one of the five densities of fast decomposing leaves in it, along with two shredder species of macroinvertebrates (Tipulidae or Pteranarcys). We will compare the wet weights of each macroinvertebrate species throughout the study as well as the dry weights of each leaf to compare the amount consumed by each macroinvertebrate. We will then repeat the study during a second three-week trial in which the experimental system and leaves will be primed with water from an agricultural stream to see the effect it has on the macroinvertebrates diet compared to the forested stream. The significance of this research will aid in restoration efforts by providing us with what type of leaf and how many leaves is most beneficial to these macroinvertebrates and therefore stream ecosystems. This experiment is crucial to stream restoration projects because it looks at what is most beneficial to the secondary production of stream ecosystems in different situations such as forested or agricultural land use.

Presenter: Nicholas R. Visser; visser@susqu.edu

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2019 - 2020 PA Executive Committee Officers

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*The PA Executive Committee's would like to say **THANK YOU** for your attendance at the Annual Technical Meeting and for your support throughout the year. We look forward to seeing everyone again next year.*

The Pennsylvania Chapter
of The American Fisheries Society

2020 Summer Social
At Raystown Field Station

Saturday, July 18, 2020
Lunch at Noon

Please bring a covered dish or dessert to share.

Business Meeting at 3 PM

With introduction of new officers.

Raystown Field Station

14322 Field Station Lane, Entriken PA 16638
GPS Coordinates: 40.367336, -78.144544

Fun for the whole family by the lake!

Come early and stay late to take part in hiking, canoeing, kayaking, swimming, fishing, fish-sampling, sightseeing, and fellowship.

Juniata College PENNSYLVANIA 1876

Raystown Field Station

For more information about the event contact: **George Merovich** at MEROVICH@Juniata.edu
To learn more about the Juniata College Field Station visit: www.Juniata.edu/offices/field-station

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Notes