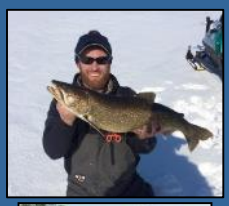
PENNSYLVANIA CHAPTER

AMERICAN FISHERIES SOCIETY

July 2017 Newsletter

2016/2017 Chapter Officers:



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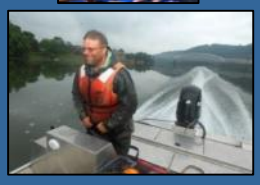


ExCom 1:
Dave Argent

ExCom 2:
Allen Keim

Student Representative:
Megan Kepler Schall

Website Manager:
Jordan Allison
Newsletter Editor:
Doug Fischer

Joint Technical Meeting of the Pennsylvania and West Virginia Chapters of the American Fisheries Society

February 9th-10th, 2017

California University of Pennsylvania

California, PA

Despite the significant snowfall, the joint meeting was attended by 113 participants from Pennsylvania and West Virginia early February this year. This attendance is the highest since the Chapter implemented biannual joint meetings and we hope to see this trend continue. Rob Criswell started off the day by presenting a vivid description of historical changes to PA's waterways. There were 27 presentations to follow covering numerous topics ranging from general fish health to specific stream studies. The central theme to the meeting "Shared Waters" was conveyed throughout many of the presentations. The best student presentation went to Megan Kepler Schall. There were an incredible 17 poster presentations on display throughout the meeting that provided for excellent discussion during the breaks and the evening social. The best poster award went to Ryan Heisler and Logan Stenger. Two Cooper Award winners were Cooper Barshinger and Shannon White, representing undergraduate and graduate status submissions respectively. Day two of the conference included hands-on workshops covering; Fish Health, Crayfish Identification and an Introduction to R. The workshops were well attended, and we would like to thank Vicki Blazer, Zachary Loughman and George Merovich for their tutelage.

– Tim Wertz

Chapter updates available at: www.pa.fisheries.org

2017 Joint Technical Meeting of the Pennsylvania and West Virginia Chapters of the American Fisheries Society

List of Contributions

Plenary Speaker

Robert Criswell - (Pennsylvania Biological Survey and Pennsylvania Game Commission, Ret.)
From Fairmont to the Big Sandy, looking back on the Mon and Ohio

Technical Sessions

Vicki Blazer - A decade of monitoring health of bass in the Chesapeake Watershed - What have we learned and where are we headed?
Alan Temple - Estimating effective water conductivity ranges for four backpack electrofisher models
Cheyenne Simpson - Immune function in Smallmouth Bass (*Micropterus dolomieu*) plays a role in susceptibility to pathogens and infections within the Potomac and Susquehanna River basin regions of the Chesapeake Bay watershed
Kyle Hartman - Seeing underwater through sound
Ryan Braham - Associations among estrogenic activity, select chemical compounds and microcystin toxins at select sites in the Potomac River drainage, USA
Cory Hartman - Estimating percent based proximate composition of Brown Trout (*Salmo trutta*) through Bioelectrical Impedence Analysis (BIA)
Heather Walsh - Pathology and risk factors associated with young-of-year Smallmouth Bass (*Micropterus dolomieu*) mortality in the Susquehanna River basin, Pennsylvania
Gregory Moyer - Applications of environmental DNA methods for inventory and monitoring of aquatic species
***Megan Kepler Schall** - Investigating trends in riverine Smallmouth Bass catch per effort data in Pennsylvania
Austen Rizzo - Development of Techniques for Assessment of Population Characteristics of the Diamond Darter
David Thorne - Crayfish as a component of the diet of stocked trout in southern West Virginia
***Shannon White** - Movers and stayers: Can we predict movement behavior in Brook Trout?
Aaron Cushing - Managing multiple non-reproducing predator species in a small West Virginia impoundment
Brandon Hoenig - DNA-based dietary analysis to investigate niche partitioning among native and naturalized salmonid species in a western Pennsylvania stream
Mike Depew - Sampling and population characteristics of catfish in Pennsylvania
Aiden Simpson - Network analysis as a prioritization tool for identifying survey sites on unassessed waters
Robert Carline - Hooking and Handling Mortality of Trout Captured in the Bald Eagle Creek Tournament
Eric Merriam - Resiliency of meso-scale thermal habitats and regfugia within an Appalachian riverscape
David Wellman - Recovery of a fish assemblage following a unique fish kill in a tributary of the Monongahela River
Ben Harris - Brook and Brown Trout movement in a restored Appalachian watershed
Rick Lorson - Dunkard Creek pollution event: Restoration status of the quality sport fish populations
Ross Andrew - Brook Trout Population Growth and Synchrony in the Central Appalachians
Erika Bendick - Lower Dunkard Creek: An assessment of water quality and biology
Patrick Shirey - Merging Ecology, History, and Law to Conserve Brook Trout in the Wild and Scenic Namekagon River, Wisconsin, USA
Whitney Peters - Beech Creek invertebrates
Harvey Katz - The bogs of Loyalsock State Forest
Dustin Smith - Recovery of a reservoir fish community from acidification

*Student Award Winner, included in the "Featured Project" section of this newsletter.

More meeting information here: http://pa.fisheries.org/

2017 Joint Technical Meeting of the Pennsylvania and West Virginia Chapters of the American Fisheries Society

Continued…list of contributions

Compendium: http://pa.fisheries.org/wp-content/uploads/2017/01/2017-AFS-Meeting-Compendium.pdf

Poster Session

Argent, D. G., J. Bartram, and N. Nelson - Benthic fish and macroinvertebrate communities of the Monongahela River: A recovery in jeopardy

***Barshinger, C. and G. Moyer** - The effects of stocked trout on *Exoglossum maxillingua* (Cutlip minnow) predator prey relationship within the Tioga River Watershed

Bechdel, K., G. Belson, and S. M. Seiler - Assessment of stream community and food web interactions in three streams feeding the Keller Reservoir

Belson, G., C. Rocco, H. Bechtold, S. Seiler, C. Keeports, and N. Welker - Use of invertebrate samples as indicators of stream community health in the Allegheny National Forest

Fetterman, J. A., S. Seiler, and H. Bechtold - Analyzing the impacts of pipeline corridors on headwater stream productivity in central Pennsylvania

Glossner, K. and S. Seiler - Effects of animal agriculture on the Marsh Creek watershed

Gurbatow, J., D. Isenberg, M. Bilger, and J. Niles - Biological Effectiveness of Instream Restoration

Hake, S., D. Ressler, and J. Niles - Prioritizing Brook Trout sampling in unnamed tributaries using a network model

***Heisler, R. E., L. R. Stenger, K. Mattas, R. Braham, D. Johnson, and G. T. Merovich, Jr.** - Linking patterns in endocrine-disrupting compounds to storm discharge and YOY SMB health in the upper Juniata River watershed

Hess, A., D. G. Argent, and W. G. Kimmel - Status of fish and macroinvertebrate communities above and below three steam impoundments: thermal implications

Kinder, P., S. Brown, D. Thorne, E. Watson, T. J. Burr, T. Petty, and E. Merriam - West Virginia wild trout stream restoration

Massie, D. L., M. Moran, G. D. Smith, and T. X. Wagner - Comparison of population characteristics of Flathead Catfish across a range of establishment levels at the Susquehanna River

Murray, J. - Analyzing brown trout movement data using ArcGIS

Ressler, D., T. Kissinger, and J. Niles - Prioritizing unnamed tributary sampling for Brook Trout using landscape variables

Thompson, T. J., T. Wagner, V. Blazer, M. Kepler, J. Niles, and A. Sperry - An investigation into the role of groundwater as a point source of emerging contaminants to Smallmouth Bass in the Susquehanna River

Zinn, D., J. Niles, and M. Bilger - Invasion of the Middle Creek watershed by the Rusty Crayfish (*Orconectes rusticus*)

Dakin B. and B. Porter - Water quality monitoring in the lower Allegheny River and its tributaries

*Student Award Winner, included in the "Featured Project" section of this newsletter.

Workshops

Vicki Blazer, **Heather Walsh, Ryan Braham, Cheyenne Simpson,** and **Megan Schall** - Fish health investigations: an introduction to field methodologies and emerging techniques

Zachary Loughman - Conservation, ecology and identification of Mid-Atlantic crayfishes

George Merovich - Introduction to R and techniques for analysis of ecological communities

More meeting information here:
http://pa.fisheries.org/

2017 Joint Technical Meeting of the Pennsylvania and West Virginia Chapters of the American Fisheries Society

Raffle Prize Winners!




A variety of donated prizes were offered for the student raffle fund raiser! Books, gear, and beverages!

Student Mentor Session

Students were given the chance to query a panel of professionals formed from research, government, NGOs, and consulting entities. Popular topics were navigating the online application processes for federal jobs, state civil service requirements, activities that attract potential employers, and preparation for graduate school applications. (photo: T. Wertz)

Evening Social!

2017 Cooper Award Winners

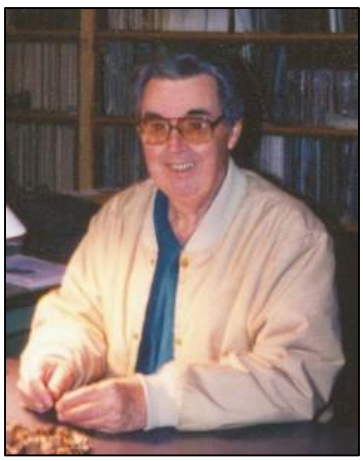
Cooper Barshinger & Shannon White

The Cooper award was created to honor the memory of the late Penn State Professor Emeritus of Zoology, and famed author of Fishes of Pennsylvania and the Northeastern United States, Edwin Lavern Cooper, Ph.D. Under this program, the Pennsylvania Chapter provides a travel award to deserving Pennsylvania undergraduate and/or graduate students to attend a professional meeting.

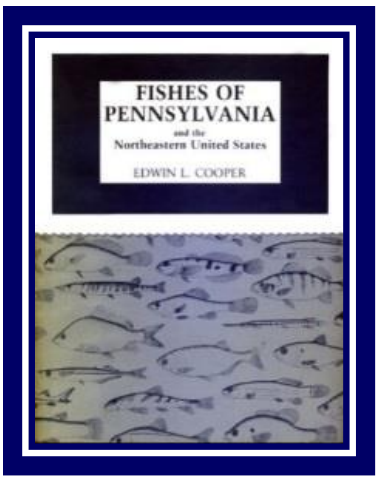
The Pennsylvania Chapter awarded the Cooper Award at its February 2017 Technical Meeting at California University of Pennsylvania to Cooper Barshinger and Shannon White, undergraduate and graduate students respectively. Their project abstracts can be found in this newsletter's *Featured Projects* section.

The Chapter will soon be soliciting abstracts for the 2018 Cooper Award. Student applicants are asked to submit a 500- to 700-word article explaining their own research, or a research project in their laboratory or college/university. The article must be written in a style (i.e., journalistic) understandable to the general public. Students may write about research that has been completed, is in progress, or is in the planning stages.

A committee chaired by Heather Smiles and selected by our Chapter's Executive Committee will judge all entries. Contact Heather at pachapterafs@gmail.com and watch the PA AFS website and emails for the article submission deadline.



Edwin Lavern Cooper, Ph.D.
1919 – 2009



Upcoming Event!!!

2017 Summer Social and Picnic

- **When: Saturday 22 July 2017**
- **Where: Zindel Park, Clinton Co. PA (near the village of McElhattan)**
- **RSVP to pachapterafs@gmail.com by 15 July**
- **This is a free event!**

The park offers many opportunities for outdoor recreation. McElhattan Creek, a Class A Brown Trout stream, flows through the park and can be fished upstream of Boyd Keller Reservoir. There are many miles of maintained hiking trails, and it is just minutes to the PFBC Pine Boat Launch on the West Branch of the Susquehanna River which offers tremendous angling opportunities for Smallmouth Bass, Walleye and Muskie.

A canoe and kayak float trip is planned from below the lowhead dam in Lock Haven to the Pine Boat Launch. The float will take 3 – 4 hours and is appropriate for all paddlers including kids and novices. Transportation to the launch point from the take out point will be provided so no need for a shuttle, however you will need to supply your own boat.

Agenda:

10:00 A.M. -West Branch Susquehanna River Paddle Trip (pack a lunch)

Meet @ Pine Boat Launch (41.164, -77.325)

Contact Jordan Allison with paddle trip questions: jorallison@pa.gov / 570-337-5971

3:00 P.M. –AFS Chapter Social & Potluck Dinner (bring a dish)

Meet @ Zindel Park (41.136, -77.341)

Burgers, hotdogs and non-alcoholic beverages will be provided for the group. Attendees are asked to bring a dish to share.

Presentation of Awards - Share in our gratitude as we say goodbye to outgoing Executive Committee members and welcome our new officers

Directions: Take Exit 116 off Interstate 220 for McElhattan/Woolrich. At the bottom of the ramp, head south on McElhattan Drive. McElhattan Drive turns into Reservoir Road at the no outlet sign. Continue straight onto Reservoir Road. Drive approximately one mile until you hit the gate. Park on the left and walk the gravel path until you arrive at the white house.

More Summer Social information here: http://pa.fisheries.org/

Meeting in planning!

2018 Spring Technical Meeting of the Pennsylvania Chapter of the American Fisheries Society

When: February 2018 (date TBA)

Where: Lycoming College, Williamsport, PA

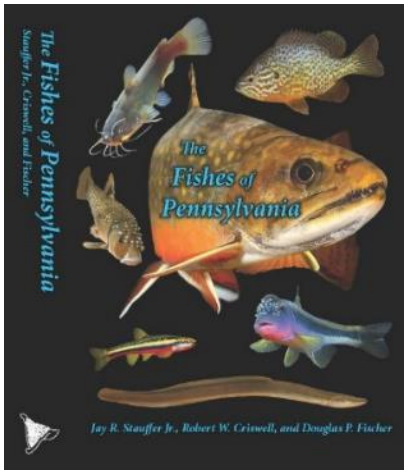
Treasurer's Report

The PA AFS chapter account balance is $13,603.94. The Cooper Student Travel award amount (included in our total account balance) is $2,037.72. Baseball hat sales benefitting the Cooper Award fund have almost recovered the total hat expense. We spent $860 to purchase hats and we have sold $690. Any profits after the expense will benefit the Cooper Award fund. The Spring Technical Meeting costs were $5,666 and income from the meeting was $5,800. - Mary Walsh

Announcement!

The PA Fish and Boat Commission, Bureau of Fisheries offices at Pleasant Gap, Centre County have **moved** to: PFBC Centre Region Office, 595 E. Rolling Ridge Dr. Bellefonte, PA 16823. An open house will be held on 12 August 2017!

Books are available!!!



THE FISHES OF PENNSYLVANIA

Jay R. Stauffer Jr., Robert W. Criswell, and Douglas P. Fischer

(2016)

Check them out @ Amazon.com or Cichlid Press

http://www.cichlidpress.com/

PA Chapter Hats are still available!!!

Contact the Chapter or Tim Wertz

pachapterafs@gmail.com or twertz@pa.gov

The PA Chapter 2017 election results have been tabulated and we are pleased to announce that the new slate of officers will be assuming their duties after a brief swearing-in ceremony at the Summer Social. Congratulations to all as we look forward to a continued high level of energy and enthusiasm to move the Chapter forward. The following members have been elected to serve starting summer 2017!

President-Elect

David Argent

California University of Pennsylvania

Dr. Argent is currently a professor at California University of Pennsylvania where he performs a variety of fisheries related research and teaches various courses in support of the Bachelor's program with a concentration in Fisheries and Wildlife Sciences. He currently advises the California Univ. Student Subunit Chapter of the PA AFS Chapter – newly formed in spring 2014. Dr. Argent is a past President and past ExComm member of the PA Chapter. At the Parent society level, Dr. Argent served as the Symposia Program co-Chair for the national AFS meeting held in Pittsburgh in 2010 and as the Northeast Education Committee representative (2010-2012). Presently he serves as a member of the Professional Certification Committee. Dr. Argent is also a life member of the American Fisheries Society and can't think of anything else he'd rather do than learn about fish.

Secretary / Treasurer

Heather Smiles

Pennsylvania Fish and Boat Commission

Heather studied Wildlife and Fisheries Science at Penn State University and currently serves as the Chief of the Natural Gas Section within the Environmental Services Division at the Pennsylvania Fish and Boat Commission. As Chief, her primary responsibility is to coordinate the review of all permit applications from activities associated with the development and transport of natural gas products from unconventional gas wells. Heather and her staff of biologists ensure protection of aquatic resources and other species under PFBC jurisdiction and gather baseline biological information through various unassessed waters surveys. Before returning to the PFBC in 2007, Heather worked in the environmental field for both the private sector and other county and state agencies. Outside of work, Heather is usually spending time with her two teenage sons and three Labrador Retrievers.

Executive Committee

Aaron M. Henning

Susquehanna River Basin Commission

Aaron M. Henning is an AFS Certified Fisheries Professional, 2007 graduate of Penn State and currently works as an aquatic biologist for the Susquehanna River Basin Commission. There he manages multiple fisheries projects including American eel re-introduction, smallmouth bass monitoring and SRBC's large river assessment project. He serves as the agency's fisheries lead and taxonomist for EPA's national surveys and holds positions on technical advisory committees for smallmouth bass and migratory fish restoration. Areas of interest include rare, threatened and endangered species, hydroelectric/energy development, nonnative fish distributions and crossing political boundaries to study fish. He has worked in every major drainage in the Commonwealth and frequently collaborates with and supports fellow resource agencies' fisheries-related projects. Outside of work Aaron spends the summers kayaking Swatara Creek and winters snowmobiling the mountain of Pennsylvania. Aaron grew up in rural northeastern Pennsylvania and currently resides in Harrisburg with his wife and son.

Student Representative

Sara Mueller

The Pennsylvania State University

Sara Mueller is a graduate of The Pennsylvania State University with both an undergraduate (Schreyer Honors College, 2014) and Masters degree (2016) in Wildlife and Fisheries Sciences. She will begin her PhD this fall working with Brook Trout in Pennsylvania. Sara's past research has focused on aquatic ecology ranging from community interactions with invasive species to metabarcoding eDNA samples for aquatic organisms. Through her work, Sara advocates for the integration of knowledge between aquatic and terrestrial ecosystems; and encourages collaboration and cooperation across respective disciplines. Outside of academics, Sara enjoys teaching hunter education courses, hiking and camping with her dog, and nature photography. Sara looks forward to this opportunity to serve the Pennsylvania Chapter of the American Fisheries Society and engaging budding professionals in our activities.

California University Subunit Update

Newly Elected Officers!

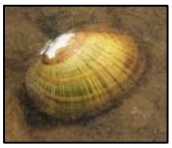
- President: **Brandon Basinger**
- Vice President: **Tara Fisher**
- Secretary/Treasurer: **Alexis Blake**
- Public Relations: **Dan McConville**
- Faculty advisor: **Dr. Dave Argent**

Subunit Pictures!

Ashley, Dan, Trevor, and Nick

Ashley, making fish print tee shirts at the recent open house at Linesville Hatchery

Tara sorting walleye at Linesville



Featured Projects

Monitoring the Native Unionid Mussel Community of the Upper Allegheny Watershed

Kyle Clark
Pennsylvania State University

My name is Kyle Clark and I am a master's student at the Pennsylvania State University. I am currently monitoring the mussel community of French Creek in the upper Allegheny watershed. French Creek is home to a large variety of freshwater fishes and macroinvertebrates that include 15 darter species (Etheostomatinii) and 25 mussel species. Although French Creek is usually known for its rich biodiversity and high water quality, it has recently come under attack from an unlikely source. The Round Goby, once only found in a few seas of Eurasia, has recently found its way into the waterbodies of the Great Lakes and their tributaries. In its native habitat, Round Gobies forage primarily on zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena bugensis*).

Its introduction in the Great Lakes region has already disrupted aquatic systems with substantial ecological and economic impacts on their fisheries. Preliminary research implicates them in the extirpation of the Mottled Sculpin (*Cottus bairdii*) and the Eastern Sand Darter (*Ammocrypta pellucida*), and the decline of the Johnny Darter (*Etheostoma nigrum*) and Iowa Darter (*Etheostoma exile*) (Jansen and Jude 2001, Dubs and Corkum 1996, Stauffer et al. 2016a). In New York tributaries to Lake Erie, where Round Gobies are now found, native darters (Etheostomatinii) are absent (Reid and Mandrak 2008). Research indicates that the introduction of Round Goby has even elicited diet and habitat shifts in native darters (Stauffer et al. 2016a).

After learning of reports of Round Gobies being collected by Fish and Boat Commission on LeBouef Lake in southern Erie County, Pa in 2014, my coworkers and I were able to pinpoint the invasion front of the Round Goby as they spread from the Great Lakes Watershed into the upper Allegheny watershed. We were able to collect Round Gobies the entire length of LeBouef Creek (outlet of

Featured Projects, continued

Clark, continued

LeBouef Lake) and eventually were able to collect specimens in the main stem of French Creek early in the spring of 2016. Because Round Gobies feed primarily on mussels in their native habitat, we decided further action was required.

In an effort to understand how the Round Goby will effect native mussel and fish communities we are working diligently to collect baseline mussel, fish, and water quality data at sites along French Creek. These sites include some that are currently occupied and unoccupied by the Round Goby. I am currently inventorying mussels at each site as well as compiling fish species occurrence lists. From these observations we will be able to determine abundances of mussels at each site and be able to document changes in mussel communities. In addition, we plan to monitor major water quality aspects (total nitrogen, PH, temperature, etc.) to watch for other factors that could cause changes in these communities. From this research I hope to gain an understanding of how this invasive species effects a practically untouched ecosystem. Moreover, I look forward to honing my mussel identification skills as well as learning valuable water quality assessment techniques. This project aligns perfectly with my future plans as I wish to continue working with freshwater ecosystems and aquatic invasive species.

Report American Eel Captures from the Susquehanna River Basin!

Aaron Henning

Susquehanna River Basin Commission
(see bio in the ExComm elections section!)

The Susquehanna River Anadromous Fish Restoration Cooperative (SRAFRC) and SRBC are building a database of American eel reports from across the Susquehanna River Basin. The American eel was once a commonly encountered migratory fish found throughout the Susquehanna River and its tributaries. The construction of hydroelectric dams along the mainstem of the river effectively extirpated eels from the system for nearly 100 years. Significant efforts from multiple natural resources agencies and dam operators have resulted in a successful trap and transport program which has returned nearly 1 million elvers to the basin. We need the help of anglers, biologists and the general public with reporting any American eel encounters so we can continue monitoring their recovery and dispersal. Reports should contain at a minimum: date, approximate location and method (angling, electrofishing, visual observation). Any other additional information is also welcome. Results of the re-introduction effort will be submitted for presentation at the 2018 AFS annual meeting Atlantic City, NJ. Thanks to all who have already assisted with this endeavor.

Reports captures to: EelReport@gmail.com or ahenning@srbc.net

Featured Projects, continued

Analysis of Dietary Overlap Among Darters in French Creek and Monitoring the Spread and Impact of Newly Introduced Round Gobies on Native Fauna

Casey Bradshaw-Wilson
Allegheny College
(see bio in the "In the Spotlight" section!)

French Creek in NWPA remains one of the few streams in the United States that holds a high abundance and diversity of fish species, including many under conservation protection. It remains an important refuge for species in the upper Allegheny River, both terrestrial and aquatic. French Creek also holds a rich diversity of darters (*Etheostoma, Percina* and *Ammocrypta* species). From 2013 to the present, surveys were conducted to determine dietary overlap of both historic collections of darters (from the 1980's) to present, as well as to compare any dietary shifts that occur from high darter diversity (>10 species within 100m) to low diversity (~6 species within 100m) reaches within the French Creek watershed. Because many of the species during surveys were still listed under conservation protection in PA, using historic collections from the same location at current surveys was an ideal approach to study diet without sacrificing listed species. In addition, by comparing diets among common species from historic and present collections inferences were made about the diet of threatened and endangered species of darter in French Creek currently. Summary of major findings include dietary trends for historic to current darter collections have remained similar, indicating species under current conservation protection have a diet that has also remained relatively unchanged. There were obvious seasonal trends in dietary components for darters and differences in diet between high and low diversity sites. Darters found in the mainstem of French Creek, especially in late summer, had a broader diet than those from earlier seasons and from smaller tributaries, which indicates food is probably not a limited resource and therefore both intraspecific and interspecific competition is low from a diet overlap perspective.

In 2014, Round Gobies (*Neogobius melanostomus*) were discovered in an inland watershed of PA, Lake LeBoeuf, which is located within the French Creek watershed. While Round Gobies have invaded tributaries to North America's Great Lakes, they have never been introduced into a stream with such a vast array of biodiversity. Since the discovery of their introduction, our research has indicated their range expansion to LeBoeuf Creek and into the mainstem of French Creek. Ways in which Round Gobies are affecting native benthic species (both fishes and native mussels) is under investigation in collaborative efforts from both Penn State University and myself at Allegheny College. Baseline data provided by studying dietary overlap in darters will provide essential information to compare how diets of native benthic species may shift in the presence of Round Gobies.

Featured Projects, continued

The Cussewago Creek Fish Atlas – Citizen Science at Work for Fish Conservation

John Tautin

US Fish and Wildlife Service (Ret.), Conneautville, PA.
(see bio in the "In the Spotlight" section!)

Citizen science based atlases that map the presence of wildlife species are important to conservation. They provide benchmarks in time and space, and thus are particularly useful in periodically assessing the status of wildlife populations in changing landscapes.

PA's Second Atlas of Breeding Birds, the PA Amphibian and Reptile Survey, and the PA Mammal Atlas have provided excellent, state-wide platforms for citizens to contribute survey data for those groups, but a similar platform for fishes does not exist. Absent one, I, a retired wildlife biologist wanting to map the occurrence of fishes in the Cussewago Creek watershed where I grew up and again reside, would have to create my own survey. That required obtaining permits, equipment, reference materials, and refresher training in fish identification. It took a while, and some expense, but the Cussewago Creek Fish Atlas is now underway.

Cussewago Creek is the largest tributary of French Creek, the latter well-studied and renowned for its diversity of fish and mussels. Some surveys of Cussewago fishes have been done, primarily by DEP, PFBC and Allegheny College. All three authors of the recently published *Fishes of Pennsylvania* have surveyed parts of Cussewago Creek, and a few sites have been surveyed under the Unassessed Waters Initiative. Some significant findings have resulted from these works, including documentation of Cussewago Creek as the stronghold for the state-endangered Redfin Shiner, and home of the only known population of Pugnose Minnow in Pennsylvania.

Most previous survey work has been one-time sampling at readily accessible sites on main stem Cussewago and its primary tributary, Carr Run. While wanting to add to knowledge of fish in these waters, I also want to expand outward and survey first order streams, beaver maintained ponds, oxbows, roadside culvert pools, most any place other than man-made ponds that might hold fish. These little habitats, collectively important, are often overlooked and vulnerable.

Typical stretch of Cussewago Creek

Case in point, in the 1950s, not far from where I now live, was a roadside wetland. It was small, but rich in native plant and animal diversity. Wood Ducks and Green Herons sometimes visited it. Muskrats built their houses in it. Snakes, frogs, Red-spotted Newts, and turtles were abundant, and fish lived there. A curious kid, I placed minnow traps just to see what I might catch. I caught Grass Pickerel, Pumpkinseed, Brook Stickleback, Central Mudminnow, and others I don't remember.

Featured Projects, continued

Tautin, continued

Today, that wetland no longer holds standing water. Two generations of farmers not paying attention to soil running off their fields, the removal of its wooded buffer, and overly zealous roadside ditching by Penn DOT, resulting in the wetland filling with silt. Soybeans now grow right to its edge, and Reed Canary Grass in the middle. The fish and most other wetland animals that lived there are gone. Except for me, I doubt that anyone knows, for no one ever documented what was there, then, in that special little place.

The goal of the Cussewago Creek Fish Atlas is to document for future reference, places where fish are currently found in the watershed. The end product will be a geo-referenced database of species and numbers of fish found at survey sites, accompanied by contemporary photos and descriptions of the sites, along with histories when known. Additionally, some voucher specimens are being reposited in the natural history collection at the Tom Ridge Environmental Center, Erie, PA. Curator Mark Lethaby is a frequent participant in the project.

While we are interested in re-sampling sites previously sampled by others, sampling is largely opportunistic in distribution and method, with no attempt to standardize effort. Depending on the site, which might be a lengthy stretch of stream, or just a roadside pool, sampling is being done by backpack electroshocking, seine, minnow trap, dip net or combinations thereof. This informal, opportunistic approach to surveying may preclude rigorous scientific testing of hypotheses, but it serves the fundamental goal of an atlas, which is document the presence of species in space and time.

Already, new knowledge of the fishes of Cussewago Creek has been gained. Ohio Lamprey, the state-threatened Southern Redbelly Dace, and the state-endangered Warmouth, previously unknown from Cussewago Creek, have been documented. Central Mudminnow, a candidate for PA T&E status, appears to be common and widespread, and three, small, isolated populations of candidate species Brook Stickleback have been found. Among more familiar species, Smallmouth Bass, once common, are scarce, but Largemouth Bass, once found primarily in stocked ponds, are now common in most streams. The search continues for Hornyhead Chub, rare in PA and documented in Cussewago prior to 1940, but not since.

More is to be learned as more sites are sampled. At the end of the survey, we expect to have sampled 200-300 sites in the watershed, from its tiny headwaters in southern Erie County to its mouth at French Creek at Meadville. Along the way were are meeting interesting people, finding special places rich in beauty and natural diversity, and we are using the survey as an opportunity to educate people about fish in their local environment.

Education might be as simple as providing curious, appreciative landowners a list of species and numbers of fish found on their property. Or it might entail tactfully advising a farmer that he or she has a T&E species in the creek, and so might want to be especially careful about farming practices. Best of all, in appropriate (safe) situations, we educate kids about fish by inviting them to help with the project. Funny, how excited a kid with a Creek Chub in a dip net can get. Sufficiently interested kids are rewarded with a copy of Ohio DNR's excellent booklet Stream Fishes of Ohio. Who knows, maybe someday one of these kids will remember that place where fish were found and want to preserve places like it.

The ongoing Cussewago Creek Fish Atlas: ambitious, maybe; arduous, often; useful, hopefully; but fun for sure!

Featured Projects, continued

2017 Cooper Award Winner (undergraduate): Cooper Barshinger

The Effects of Stocked Trout on *Exoglossum maxillingua* (Cutlip Minnow) Predator Prey Relationship within the Tioga River Watershed

Cooper Barshinger and Gregory Moyer
Mansfield University of Pennsylvania

Within Pennsylvania, stocked trout are released into streams throughout the year. Trout become piscivorous as adults, preying on smaller fish. Introductions of a predator can influence the life history of prey species (Walls et al 1990). For example, the size distribution and relative weights of prey species can change, going from smaller more abundant prey in a system without a predator (i.e., prey have reached carrying capacity and become stunted in a system without a predator), to large and less abundant prey in a system with a predator (Jakobsen et al 1988). The goal of my study was to assess the impact of trout stocking on key life history traits of a minnow species, the Cutlip minnow (*Exoglossum maxillingua*). Specifically, I tested whether average length and relative weight of the minnow differed significantly between stocked and non-stocked streams.

Four streams (two non-stocked and two stocked) were randomly sampled for Cutlip minnow. All streams comprised the Tioga River watershed. Each stream was divided into nine 100 m sections of run, riffle, and pool habitats. Out of these nine sites, three were randomly selected and sampled by backpack electrofishing. Fish were enumerated and measured for total length (mm) and weight (g). The average length of Cutlip minnow for each stream was estimated and variation in mean length between treatments was assessed using a t-test. I estimated average relative weights for age-1 fish from each stream and assessed significance in weight between treatments using a t-test (age was estimated via length distributions for each treatment). Deviations from normality and homogeneity of variances were examined using normal quantile plots and Leven's test, respectively.

A total of 141 Cutlip minnow were collected (nSTOCKED = 117, nNON-STOCKED = 24). Due to discrepancies in sample sizes between treatments, I randomly sampled individuals (n=24) from the stocked group, then performed a t-test between treatments using the truncated dataset. There were 13 and 26 age-1 individuals from non-stocked and stocked treatments, respectively. The average length of Cutlip minnow for stocked and non-stocked groups was 81.5 mm and 71.13 mm, respectively. This difference was significant (n = 2, P = 0.0218). Average relative weights for stocked and non-stocked groups was 99.46 and 107.84. The difference was not significant for age-1 average relative weight (P = 0.84).
The average length between treatments was found to be significantly different. It appears that stocked trout may be controlling the length of Cutlip minnow by allowing minnows that did survive to grow to a size larger than the gape size of stocked trout. In contrast, without trout acting as a top predator I'd expect Cutlip minnows to be of smaller as predicted by intraspecific competition for a limited food source (Walls et al 1990)

Featured Projects, continued

Barshinger and Moyer, continued

The average relative weight of age-1 fish inhabiting non-stocked streams was expected to be less than that of stocked streams because of intraspecific competition for a limited food source. Unfortunately, these data do not support this hypothesis. A possible explanation for this unpredicted outcome could be due to the fact that trout are introduced to streams with a larger biomass than the stream would naturally hold. In order for the trout to survive, they must consume a food resource other than Cutlip minnow – perhaps even competing for resources of prey species (i.e., interspecific competition). In fact, the most common food source for Cutlip minnow are macroinvertebrates (Johnson et al 1981), which can comprise a large portion of a trout's diet. For example, Eby et al. (2006) found that when trout competed with galaxiids for macroinvertebrates, trout actually displace galaxiids to areas where no trout could inhabit. Other factors that may have influenced my results include, but are not limited to, small sample sizes, varying nutrient levels or organic matter, stream size, and species diversity among sampled streams. An example of this can be seen in the studies supporting decreased food availability in low nutrient and organic-matter supplies leading to strong effects on growth rates of fish (Schlosser et al 1991)

2017 Cooper Award Winner (graduate): Shannon White

Understanding Individual-Based Ecology to Improve Brook Trout Management

Shannon White
Pennsylvania State University
(see bio in the "In the Spotlight" section!)

Coldwater streams flowing through the Appalachian Mountains give life to one of region's most valuable social and economic resources: brook trout. The vitality of arguably the most beautiful freshwater species is brought center stage in fall as fish prepare to engage in yearly spawning rituals. Vibrant orange colors are donned, miles of stream are traversed, and battles are fought all for the sake of producing the healthiest offspring.

However, for many streams along the east coast, this fall may have been the last fanfare for brook trout. Within its native range on the east coast, fewer than half of historic populations remain, and surviving brook trout are swimming in troubled waters.

Unfortunately, by the time the causes of brook trout decline became evident to biologists, much of the damage had already been done. Early 20th century logging destroyed critical spawning habitat, initiated watershed development, and left many streams exposed to the hot sun. Construction of roadways across

Featured Projects, continued

White, continued

streams isolated populations by making it impossible for fish to move long distances to complete their life cycle. And, the introduction of nonnative species, particularly brown trout, gave brook trout an indomitable competitor.

There is good news, however. Billions of dollars have been spent over the last 20 years to restore stream habitat, reforest watersheds, and enforce harvest regulations. However, these initiatives may only act as a short term band-aid as there remains one overwhelming threat biologists have no answer for - climate change. Many brook trout populations struggle to survive the summer heat, and increased temperatures projected with climate change may be the tipping point that causes rapid loss of populations.

Are brook trout destined for extinction? That is a future I'm hoping my research with Dr. Tyler Wagner can help avoid. One challenge is that the tools available to fisheries managers focus on solving problems within a watershed and are not prepared to tackle species-wide problems like climate change. I believe the solution is to go back to basics and gain a better understanding of brook trout ecology.

The focus of my research is to better understand individual variation within populations. Fish living in the same stream vary widely in their genetic, behavioral, and physiological attributes. However, the causes and consequences of this variation are not well understood. I'm hopeful that if we tease this apart, we can predict certain traits that will be particularly successful in future environments. For example, if there is a gene that increases heat tolerance, then conservation of that gene might be a management focus.

To understand individual variation in behavior I completed a multi-season telemetry study to determine why some brook trout move large distances while others stick close to home. Movement behavior is particularly interesting because it is an ecological catch-22. By moving, fish can escape bad habitat and maintain connectivity to neighboring populations. However, moving is dangerous, as it increases the risk of predation and takes calories away from growth and reproduction. Long- and short-term population survival is maximized if there is a mixture of both risky 'movers' and cautious 'stayers.' I tagged over 160 brook trout and tracked their movement in summer and fall, and am currently in the process of determining whether movement can be predicted by genetics.

The use of telemetry also allowed me to gather data on other aspects of individual ecology, including cellular responses to stress. Since May I have been collecting gill filaments and blood samples from tagged fish to quantify the level at which certain genes are expressed as stream temperatures rise. The genes I'm interested in are like canaries in the coal mine - they are only expressed when a fish is stressed, but before there are observable changes to fish behavior or mortality. By documenting expression of these genes over time, I can determine how individuals respond differently to thermal stress and how chronic stress may have caused some populations to evolve tolerance to higher temperatures.

While my research focuses on brook trout, few species will be unaffected by climate change. I hope my results will not only improve trout management, but highlight the need to incorporate individual ecology into species conservation. More details about my research can be found at my website, www.thetroutlook.com.

Featured Projects, continued

2017 Joint Technical Meeting, Best Student Presentation Winner: Megan Kepler Schall

Investigating Trends in Riverine Smallmouth Bass Catch per Effort Data in Pennsylvania

Megan Kepler Schall[1,2], Tyler X. Wagner[3] , Robert M. Lorantas[4], Geoff D. Smith[4], and Vicki S. Blazer[5]

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[4] Pennsylvania Fish and Boat Commission
[5] U.S. Geological Survey, Fish Health Research Laboratory, Kearneysville, WV.

Smallmouth bass *Micropterus dolomieu* in Pennsylvania are an important recreational fish species. However, smallmouth bass in the Susquehanna River and its tributaries have been documented to have clinical signs of disease, intersex, mortality, and reported declines in catch rates have occurred since 2005. Other major rivers including the Delaware and Allegheny rivers have not had similar fish health concerns. The goal of this research was to compare temporal trends in catch rates of smallmouth bass from major rivers or river sections in the state, including the Susquehanna River Basin, and to consider these trends within the context of the timing of disease events. We used fishery survey data collected by Pennsylvania Fish and Boat Commission and dynamic linear models to quantify trends and to estimate annual probabilities of decline in catch per unit effort for major rivers and river sections in the state from 1990 to 2011. Periods of declines in catch rates for total catch (all sizes of fish sampled) were present in most rivers or river sections, but were most pronounced in the Susquehanna River Basin. Within the Susquehanna River Basin there was variability in the timing, duration, and magnitude of declines with trends beginning to stabilize towards the end of the time series. Declines in catch rates throughout the Susquehanna River Basin began prior to the observation of overt disease outbreaks in all rivers and river sections evaluated. The Delaware and Allegheny rivers did not have similar trends, although the Allegheny River did have a period of decline beginning towards the end of the time series. When the analyses were restricted to fish greater than 375mm in length, trends in catch rates were increasing or stable across all rivers and river sections for the majority of the time period evaluated. Evaluation of trends in catch per unit effort data provides insight for both researchers and managers regarding the dynamics of the fishery and how this relates to changes in environmental conditions as well as management needs of the system.

Left: A male Pink Salmon captured from a Lake Erie tributary, Erie County, PA. (photo courtesy of Mark Haffley)

Right: A Cisco captured from a northeastern PA lake. (photo: D. Fischer)

Featured Projects, continued

2017 Joint Technical Meeting, Best Student Poster Winners: Ryan Heisler and Logan Stenger

Linking Patterns in Endocrine-Disrupting Compounds to Storm Discharge and YOY SMB Health in the Upper Juniata River Watershed

Heisler, Ryan E.[1], Logan R. Stenger[1], Katie Mattas[1], Ryan Braham[2], Dennis Johnson[1] and George T. Merovich, Jr.[1]

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[2]US Geological Survey, Fish Health Branch, Leetown Science Center, Kearneysville, WV

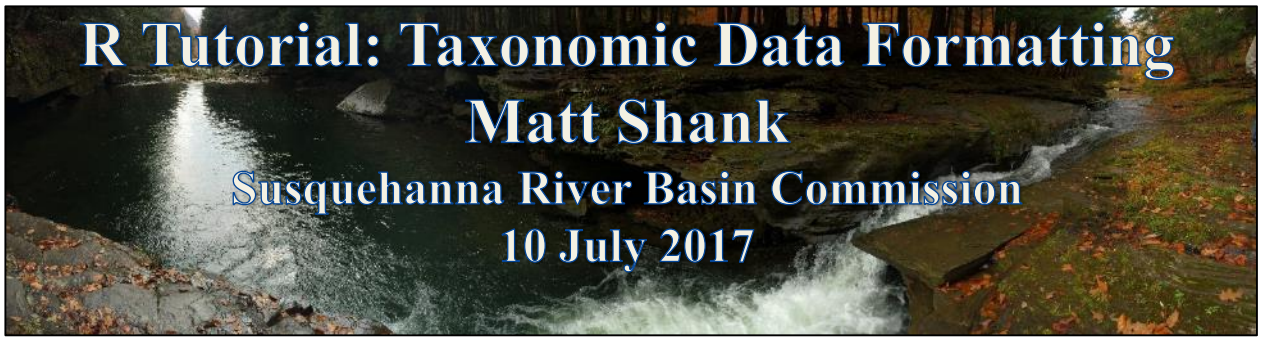
Population declines and disease incidence in smallmouth bass (*Micropterus dolomieu*) in the Susquehanna River basin have been linked to endocrine-disrupting compounds (EDCs) as a likely causative agent. Nothing is known about this link in the upper Juniata River basin and how EDC patterns may vary with hydrologic conditions. Consequently, we sampled water in the basin for EDCs across a range of discharges to identify possible connections between storm flow and spikes in EDC concentrations. We surveyed young-of-the-year (YOY) smallmouth bass populations, collected information on their diet, and recorded incidence of disease as well. We found high variation in EDCs concentrations (measured as total estrogenicity) at the site level and across the watershed. EDC concentrations varied with discharge. YOY smallmouth bass were in excellent condition and sustained very few abnormalities. Nearly all individuals had abundant prey items in the stomach. Much of this study is still on-going, including histopathological analysis of fish, but early indications suggest that EDCs are present in quantities that should be considered important for addressing smallmouth bass anomalies in the broader Susquehanna River basin.

Left: Aaron Frey displaying a wild Lake Trout in northeastern PA.

Right: Dave Spotts enjoys a day in the field performing electrified benthic trawl surveys of the Allegheny River during a bridge project assessment.

(photos: D. Fischer)

Featured Projects, continued



I've been struggling with analysis of taxonomic data for years. Not the analysis itself (well, usually), but sometimes the most basic formatting issues can be very time consuming and labor intensive.

In a typical scenario, I'll collect fish assemblage data and then, to round out my dataset, I'll get data from another agency or two. These data are usually in excel, but often stored in different tabs, files, formats, etc. I most often work within the Susquehanna River drainage in the northeast US, so I built a metric calculator in Excel that has all [78] possible fish taxa and their ecological attributes. It has been such a huge pain to get all the data into a format that I can easily enter into the metric calculator that I finally decided to sit down and use R to do the leg work for me. It's too bad I didn't do this a long time ago, turns out to be pretty simple. I'll attempt to fire up RStudio and provide a reproducible example below. Many of the issues revolve around getting your data from 'wide' format where each variable is in a separate column, to 'long' or 'stacked' format. If you're interested in some background, here is a great tutorial on how to use the reshape2 library to use cast or melt functions to get your data into wide or long formats.

Below are 3 common scenarios:

Scenario 1) You have a .csv file of data in 'stacked' format, where you have at least 3 columns, taxa name, abundance, and site. This is IDEAL.

Scenario 2) Your data are in one excel [.xlsx] spreadsheet, but is in different tabs. This is common and not a big deal.

Scenario 3) Your data are in multiple .csv files, which are all saved in the same folder.

I have reproduced these three scenarios with randomly generated fish assemblage data from 4 fictitious streams here (http://srbc.net/PA_AFS_vignette/files.zip). Go to the link and download the all the files. Then, save the files in your working directory to follow along. I'm assuming that you are proficient in R to the point where you understand basic coding, allowing you to set your working directory, import data, load packages, etc. But if you aren't the script ('AFSscript.R') in the link above should do all the steps contained herein, so long as you set your working directory correctly. Or, after downloading all files to your working directory, you could copy and paste the code below in your console in R, which would also allow you to follow along.

Featured Projects, continued

Shank, continued

First set your working directory and load all the packages we may need below:
setwd("C:/Program Files/R....") #make sure to set this to the directory where you downloaded the files from the link above

install.packages("purrr");library(purrr)

install.packages("readxl"); library(readxl)

install.packages("reshape"); library(reshape)

Scenario 1

1) You have data in 'stacked format', this is IDEAL. This is usually easily accomplished, all you really need are three columns: 'CommonName', 'abundance', and 'site'. If your data are formatted differently, there are ways to get data to look like this using melt() in the reshape library. This is the scenario that is easiest to deal with and is the goal of the remaining scenarios.

- This is the 'StackedTaxa.csv' file here.

If you're fortunate enough to have data in stacked format, just import your data (in .csv format),

```
dfstack1 <-read.csv("StackedTaxa.csv", header=T)
head(dfstack1)
              CommonName abundance       site
1                alewife       141 ColdStream
2         blacknose dace       135 ColdStream
3         chain pickerel        83 ColdStream
4         cutlips minnow       144 ColdStream
5         fantail darter       135 ColdStream
6 fourspine stickleback        47 ColdStream

tail(dfstack1)
            CommonName abundance      site
78       shield darter       153 WarmBrook
79 shorthead redhorse       125 WarmBrook
80     smallmouth bass       175 WarmBrook
81     spottail shiner       162 WarmBrook
82        yellow perch       128 WarmBrook
83       mimick shiner        36 WarmBrook

summary(dfstack1)
               CommonName   abundance                    site
 mummichog           : 4   Min.   :  1.0   ColdStream      :14
 mottled sculpin     : 3   1st Qu.: 82.5   DepauperateCreek: 9
 northern hog sucker: 3   Median :133.0   DiverseRun      :38
 shield darter       : 3   Mean   :127.8   WarmBrook       :22
 banded killifish    : 2   3rd Qu.:171.0
 bluespotted sunfish: 2   Max.   :296.0
 (Other)             :66
```

Now you're good to go! Proceed to after Scenario 3 below.

Featured Projects, continued

Shank, continued

Scenario 2

2) Your data are in one excel [.xlsx] spreadsheet, but is in different tabs. This is common. Once again your goal is to stack your data into 3 columns.

- This is the 'SepTabs.xlsx' file here, follow the steps below to stack your data.

```
file <- "SepTabs.xlsx"
sites <- excel_sheets(file) #need library(readxl)

dfstack2 <- map_df(sites, ~ read_excel(file, sheet = .x)) #need
library(purrr)

head(dfstack2)
# A tibble: 6 × 3
             CommonName abundance       site
                  <chr>     <dbl>      <chr>
1               alewife       141 ColdStream
2        blacknose dace       135 ColdStream
3        chain pickerel        83 ColdStream
4        cutlips minnow       144 ColdStream
5        fantail darter       135 ColdStream
6 fourspine stickleback        47 ColdStream

tail(dfstack2)
# A tibble: 6 × 3
          CommonName abundance      site
               <chr>     <dbl>     <chr>
1      shield darter       153 WarmBrook
2 shorthead redhorse       125 WarmBrook
3    smallmouth bass       175 WarmBrook
4    spottail shiner       162 WarmBrook
5       yellow perch       128 WarmBrook
6      mimick shiner        36 WarmBrook

summary(dfstack2)
  CommonName          abundance         site
 Length:83          Min.   :  1.0   Length:83
 Class :character   1st Qu.: 82.5   Class :character
 Mode  :character   Median :133.0   Mode  :character
                    Mean   :127.8
                    3rd Qu.:171.0
                    Max.   :296.0

write.csv(as.matrix(dfstack2), file="dfstack2.csv")
# this gives you the exact same result as 'StackedTaxa.csv', with the data
originally belonging to multiple tabs in the same excel spreadsheet
```

Now you're good to go! Proceed to after Scenario 3 below.

Featured Projects, continued

Shank, continued

Scenario 3

3) Now this may be the most complex of the 3 scenarios by a slight margin, but it's still pretty simple to handle your data. Say your data are in multiple .csv files, which are all saved in the same folder. If this is your situation, it may be best to save your .csv files in a sub folder within your working directory, as I've done with the folder called 'Scen3_csvs', which is also saved here. Follow steps below.

```
file_names <- dir("./Scen3_csvs/") #where you have your files saved


dfstack3 <- do.call(rbind,lapply(file_names,read.csv)) #truly beautiful, this
gives you the same stacked data frame as in Scenarios 1 and 2 above
```

*** If this is throwing an error message (`Error in file(file, "rt") : cannot open the connection`…), you may need to first set your working directory to the folder where you have your .csv files saved, then re-run the lines above starting with `'file_names'` and `'dfstack3'`:

```
setwd("C:/Users/.../Scen3_csvs")
file_names <- dir("C:/Users/.../Scen3_csvs/")
dfstack3 <- do.call(rbind,lapply(file_names,read.csv)) #this should work now
```

*****Just remember to change your working directory back to where it was originally set before proceeding.**

Now, that you have your data in stacked format, with either dfstack1, dfstack2, or dfstack3 from above, let's get data into matrix format, where the taxa names are row headings and the site names are the column headings. This is easily accomplished using the `cast()` function in the reshape library:

```
dfmod <- cast(dfstack1, CommonName~site, value = "abundance", fun=sum)

head(dfmod)
            CommonName ColdStream DepauperateCreek DiverseRun WarmBrook
1              alewife        141                0          0         0
2         American eel          0                0         12         0
3        American shad          0                0          0       141
4    banded killifish          0                0          1         9
5       blacknose dace        135                0          0         0
6 bluespotted sunfish          0                0         34       185
```

This line of code creates a new data frame (`dfmod`) in matrix format just how I want it, taxa in rows and site in columns. The '`CommonName~site`' bit takes care of that, if you'd prefer to transpose the data just reverse the terms as seen below where `dfmod2` is created. Setting '`fun=sum`' ensures that if for some reason there were multiple entries of the same taxa at the same site, which has happened to me before, then the total of the taxa will be summed.

.

Featured Projects, continued

Shank, continued

```
dfmod2 <- cast(dfstack1, site~CommonName, value = "abundance", fun=sum)
#transpose
head(dfmod2)
site              alewife  American eel American shad   banded killifish
ColdStream         141           0             0                0
DepauperateCreek   0             0             0                0
DiverseRun         0            12             0                1
WarmBrook          0             0           141                9
```

Now that the data are in matrix form the work may be done. But I often have to go a step further and align this data within a larger structure. I usually want to enter the data in the metric calculator I mentioned earlier, the one that calculates many ecological traits of fishes just by entering taxonomic count data. So, if I'd like to do that matching in an automated fashion in R rather than the old fashioned, manual way in excel, I just need to import a matrix of my metric calculator and use the `merge` function to bind the two together. Call the 'TaxaTemplate.csv' file from your working directory and proceed with the code below:

```
TaxaTemplate<-read.csv("TaxaTemplate.csv", header=T) #load fish metric
calculator template matrix that contains scientific names

head(TaxaTemplate)
        Family             GenusSpecies          CommonName
1  Anguillidae        Anguilla rostrata        American eel
2 Catostomidae       Carpiodes cyprinus           quillback
3 Catostomidae    Catostomus commersoni        white sucker
4 Catostomidae        Erimyzon oblongus    creek chubsucker
5 Catostomidae    Hypentelium nigricans northern hog sucker
6 Catostomidae Moxostoma macrolepidotum  shorthead redhorse
```

Now, all that's left to know is merge your taxonomic data to this larger template:

```
taxafinal <- merge(dfmod, TaxaTemplate, by="CommonName", all.x=TRUE)
head(taxafinal)#made small so you can see everything
          CommonName ColdStream DepauperateCreek DiverseRun WarmBrook       Family          GenusSpecies
1            alewife        141               0          0         0     Clupeidae   Alosa pseudoharengus
2        American eel          0               0         12         0   Anguillidae      Anguilla rostrata
3       American shad          0               0          0       141     Clupeidae      Alosa sapidissima
4    banded killifish          0               0          1         9    Fundulidae     Fundulus diaphanus
5      blacknose dace        135               0          0         0    Cyprinidae  Rhinichthys atratulus
6 bluespotted sunfish          0               0         34       185 Centrarchidae Enneacanthus gloriosus


tail(taxafinal)
          CommonName ColdStream DepauperateCreek DiverseRun WarmBrook       Family          GenusSpecies
52    smallmouth bass          0              66          0       175 Centrarchidae  Micropterus dolomieu
53    spottail shiner          0               0        220       162    Cyprinidae    Notropis hudsonius
54 tessellated darter         30               0        249         0      Percidae   Etheostoma olmstedi
55            walleye          0               0        165         0      Percidae        Sander vitreus
56       white sucker          0               0         62         0  Catostomidae Catostomus commersoni
57       yellow perch          0               0          0       128      Percidae      Perca flavescens
```

Featured Projects, continued

Shank, continued

In the merge function, you're directing the '`dfmod`' and '`TaxaTemplate`' dataframes to be merged by the '`CommonName`' column. Be sure to specify '`all.x=TRUE`' so that taxa not in the `TaxaTemplate` are included in the resulting matrix!! This accounts for misspellings and taxonomic updates that are common when dealing with this type of data. You'll see I snuck in a couple of misspelled taxa, which are not uncommon if you have interns recording/entering data (i.e. creak chub and mimick shiner).

The above formula ONLY merges taxa that are present in our `dfmod` dataframe to the `TaxaTemplate`. All taxa that are not present are omitted. If we want to merge ALL rows, the '`all=TRUE`' argument needs to be specified:

```
taxafinal2 <- merge(dfmod, TaxaTemplate, by="CommonName", all=TRUE)
head(taxafinal2)
```

	CommonName	ColdStream	DepauperateCreek	DiverseRun	WarmBrook	Family	GenusSpecies
1	alewife	141	0	0	0	Clupeidae	Alosa pseudoharengus
2	American eel	0	0	12	0	Anguillidae	Anguilla rostrata
3	American shad	0	0	0	141	Clupeidae	Alosa sapidissima
4	banded killifish	0	0	1	9	Fundulidae	Fundulus diaphanus
5	blacknose dace	135	0	0	0	Cyprinidae	Rhinichthys atratulus
6	bluespotted sunfish	0	0	34	185	Centrarchidae	Enneacanthus gloriosus

```
tail(taxafinal2)
```

	CommonName	ColdStream	DepauperateCreek	DiverseRun	WarmBrook	Family	GenusSpecies
75	rainbow trout (hatchery)	NA	NA	NA	NA	Salmonidae	Oncorhynchus mykiss
76	rosyside dace	NA	NA	NA	NA	Cyprinidae	Clinostomus funduloides
77	spotfin shiner	NA	NA	NA	NA	Cyprinidae	Cyprinella spiloptera
78	swallowtail shiner	NA	NA	NA	NA	Cyprinidae	Notropis procne
79	white crappie	NA	NA	NA	NA	Centrarchidae	Pomoxis annularis
80	yellow bullhead	NA	NA	NA	NA	Ictaluridae	Ameiurus natalis

The '`all=TRUE`' argument fills all taxa that aren't present with NA values.

Now all that's left to do is write your final dataframe to a .csv file that can be read by excel. This data frame can be sorted any which way and pasted into metric calculators with ease, saving hours and blurred vision.

```
write.csv(as.matrix(taxafinal2), file="taxafinal2.csv")
```

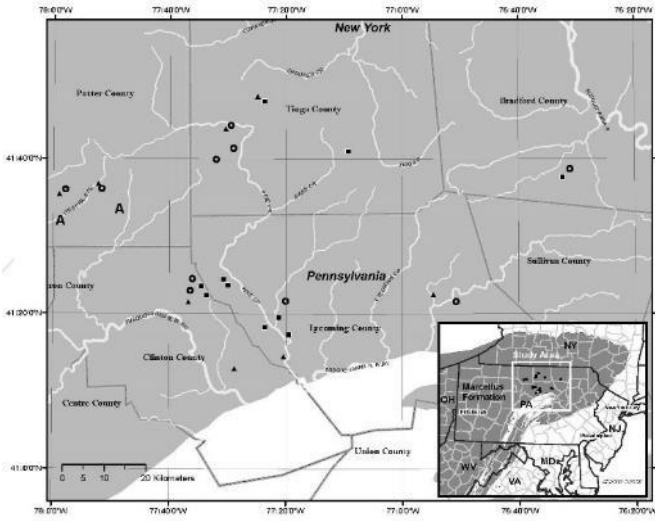
You can now move on to more intellectually stimulating forms of data analysis. Go ahead and calculate metrics, attach environmental data, represent graphically, and begin building statistical models. The formatting should be automated as much as possible so valuable brain cells and effort aren't wasted.

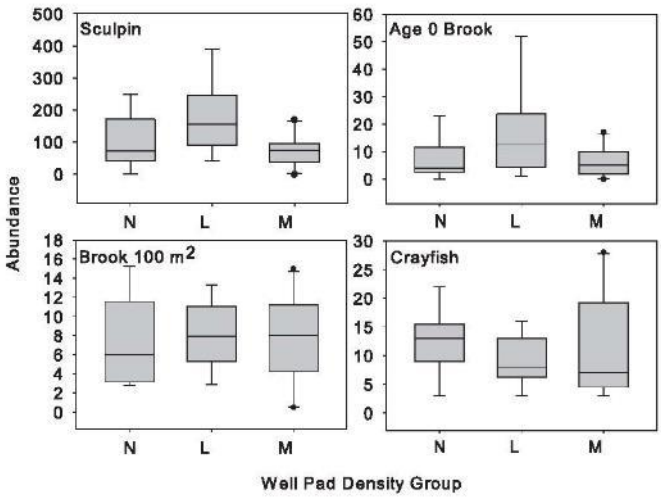
Featured Projects, continued

Natural Gas Drilling in the Marcellus Shale Region: Well Pad Densities and Aquatic Communities

David H. Keller, Richard J. Horwitz, Jerry V. Mead, and Thomas J. Belton
Academy of Natural Sciences of Drexel University
(see Dave's bio in the "In the Spotlight" section!)

Although there are many environmental concerns, few studies have assessed the ecological impacts of shale drilling. In this study, we looked at 28 sites in north-central Pennsylvania to assess the potential impacts of shale drilling. We used well pad density (# of well pads/watershed area) as our stressor gradient and focused on highly forested sites, excluding areas with acid mine drainage. In the end, we did not observe an impact to the fish, crayfish or salamander assemblages in these streams. We intend to return to these sites in the future to assess the long-term impacts of drilling. This study assessed waters under the least intrusive scenario for shale drilling (i.e., high forest cover with little deforestation and well pads set back from the stream). Areas with drilling infrastructure closer to the stream and with less forest cover present more intrusive scenarios and should be investigated in the future.





Left: A Cormorant finds a catfish dinner.

Right: A Great Blue Heron with a Threespine Stickleback

(photos: R. Criswell)

Aiden Simpson

Pennsylvania Fish and Boat Commission and Western Pennsylvania Conservancy

Aiden is a contract fisheries biologist in the Coldwater Unit at the Pennsylvania Fish and Boat Commission, and is contracted through the Western Pennsylvania Conservancy. Aiden currently serves as a coordinator for PA's wild trout assessment effort, called the Unassessed Water Initiative. Aiden received his B.S. (2012) in Environmental Biology from Clarion University. Within the Coldwater Unit, Aiden's primary responsibility is to weigh Unassessed Waters program priorities with information on current wild trout distribution to create stream survey assignments that meet the agency's wild trout assessment objectives. Other responsibilities include working with the Coldwater Unit team to process and QA/QC cooperator wild trout surveys, assisting cooperators in the field, and follow up inventories on streams surveyed through the assessment program that have the potential to be designated Class-A wild trout.

Casey Bradshaw-Wilson

Allegheny College

Casey Bradshaw-Wilson has been an Assistant professor at Allegheny College in Meadville, PA for the past 4 years. Teaching in both the Environmental Science and Biology departments, her courses are focused on Stream Ecology and Conservation Biology. She received her B.S. from Penn State Behrend in Biology with a focus in Ecology, a M.S. from Marshall University in Biology with a concentration in Herpetology and a Ph.D. from Penn State University in Wildlife and Fisheries Biology. Her passion is in freshwater ecology and research interests at this time focus on competition among native benthic fishes in PA water's as well as how the newly introduced Round Gobies are impacting our freshwater systems.

Marisa Logan

Civil & Environmental Consultants, Inc.

Marisa has been a Certified Fisheries Professional since 2009 and serves as a Project Manager at Civil & Environmental Consultants. She has been at CEC for 13 years and oversees their aquatic laboratory, which includes fish, macroinvertebrate, and water quality sampling gear. Marisa graduated from Waynesburg University (2001) with a B.S. in Environmental Science and from West Virginia University (2003) with a M.S. in Fisheries Management. For her masters, she used radio telemetry to track brook trout movement and study their microhabitat preferences. She is also a certified taxonomist in eastern EPT and chironomids through Society of Freshwater Science (SFS), and a Level 3 Qualified Data Collector under the OEPA Surface Water Credible Data program. Her main professional interests include stream restoration, non-game fish, and using macroinvertebrates to assess impacts and determine stream health. She and her co-workers recently published results from a fifteen-year study of stream restoration and recovery over longwall mines in southwestern Pennsylvania. Most of Marisa's work includes macroinvertebrate sampling and identification for client permit requirements in Pennsylvania, West Virginia, and Ohio. She is looking forward to getting more experience this summer with threatened and endangered fish species.

Mark A. Hartle

Pennsylvania Fish and Boat Commission

Mark Hartle is the Environmental Services Division Chief for the Pennsylvania Fish and Boat Commission. He has been employed by PFBC since 1993. His responsibilities have included water quantity issues, including ecological flows and water withdrawals, water policy, water quality, hydropower, plant control and invasive species. He is an alternate for the Executive Director on the Pennsylvania Environmental Quality Board. Along with other Division of Environmental Services staff, he provides biological expertise in pending law enforcement cases. Mr. Hartle is member of the American Fisheries Society and Instream Flow Council. He received his Bachelor of Science degree in Biology from the University of Pittsburgh at Johnstown in 1978 and his M. S. degree in Natural Resources from Cornell University in 1983. His career in environmental science began in the Pennsylvania Department of Environmental Resources water supply program. Mr. Hartle is married to Patti Cameron Hartle and has three grown children. Personal interests include fishing, travel, church activities, wood working, biking, and reading.

Shannon White

Pennsylvania State University

Shannon is a fourth-year Ph.D. candidate working with Tyler Wagner in the Ecology Program at Penn State. She hails from Richmond, Virginia, and received her B.S. in in Environmental Studies and Biology from Randolph-Macon College and M.S. in Wildlife and Fisheries Science from Virginia Tech. She's studied rare minnows in Appalachian coal mines, live bearers in Panama, and stream habitat through the United States. However, the topic she's most interested in is right here in our backyards- eastern brook trout. For her dissertation, she is studying the evolutionary significance of individual variation to determine whether there are specific genes or phenotypes that lead to increased resiliency to habitat loss. For more information on Shannon's research, visit her website at www.thetroutlook.com.

Mark Lethaby

Pennsylvania Sea Grant and Pennsylvania Fish and Boat Commission

Mark Lethaby is employed by Pennsylvania Sea Grant as the curator of the Natural History Museum at the Tom Ridge Environmental Center. He also works as a fisheries biologist aide for the Pennsylvania Fish and Boat Commission. Mark is the northwest regional coordinator for the Pennsylvania Amphibian and Reptile Survey, and served in the same capacity for the Pennsylvania Herpetological Atlas Project. He earned his B.S. in Biology from Penn State University.

Dave Keller

Academy of Natural Sciences of Drexel University

Dave is a Fisheries Biologist at the Academy of Natural Sciences in Philadelphia, where he has been working since 2004. While at the Academy, Dave has worked on a variety of projects dealing with water quality, stream restoration, age and growth determination, otolith microchemistry, general species inventories, invasive species, and conservation of endangered, threatened, and candidate species. Currently, Dave is researching the scale-dependence of habitat variables for specific fishes and predictors of fish occurrence. He is managing the fisheries component of the Delaware River Watershed Initiative, a program that works to restore and conserve water quality in the Delaware Basin. He is researching the effects of dam removal on the occurrence of American Eel and Sea Lamprey in the Paulins Kill, near Columbia, NJ. Lastly, he is working with the Academy's biogeochemistry section, USGS, and the University of Windsor to use otolith microchemistry as a tool for monitoring streams that may have received contamination from hydraulic fracturing in PA. In his free time, Dave spends time with his wife Kim and kids Samantha (6), Evan (4), and Madelyn (1).

John Tautin

United States Fish and Wildlife Service (Ret.)

John Tautin is a retired biologist now living on a farm in NW PA close to where he grew up hunting, fishing and trapping along Cussewago Creek. His early interest in fish and wildlife led him to Penn State where in 1969 he earned a BS degree in Zoology. Coursework under Ed Cooper and Bob Butler stimulated an interest in a fisheries career, but a summer job offer from the USFWS' Huron [SD] Wetland Acquisition Office opened an avenue to a wildlife career. After serving two years in the US Army and earning a MS degree in Wildlife Science from Utah State University, John joined the USFWS for a 30 year career in migratory bird conservation. In his last position he was Chief of the US Bird Banding Lab. In retirement, John has served as Executive Director of the Purple Martin Conservation Association, regional coordinator for PA's Second Breeding Bird Atlas, and director for the French Creek Valley Conservancy and the Crawford County Agricultural Land Preservation Board. Lately his interests have returned to fisheries. With permit in pocket and APB-3 on his back, he is compiling an atlas of the fishes of the Cussewago Creek Watershed.

2018 Newsletter!

The Chapter is looking for a newsletter editor! Any takers out there?

Do you have pictures, a professional bio, or a project that you would like featured in next year's PA Chapter AFS newsletter?

Please contact Jordan Allison at jorallison@pa.gov.