Annual Meeting of the Virginia Chapter of the American Fisheries Society

February 11-13, 2014

Fredericksburg, Virginia

Fish

Virginia *is for Lovers*®

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VIRGINIA CHAPTER of the AMERICAN FISHERIES SOCIETY

Inland Fisheries and Aquatic Resources of Virginia

Organized in 1990

Annual Meeting of the Virginia Chapter of the American Fisheries Society

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The American Fisheries Society (AFS), founded in 1870, is the oldest and largest professional society dedicated to strengthening the fisheries profession, advancing fisheries science, and conserving fisheries resources.

The Virginia Chapter of the American Fisheries Society is a subunit of the American Fisheries Society. The chapter was established in 1990 to provide fisheries professionals in Virginia with increased access to AFS; encourage the exchange of information among fisheries and other aquatic resource professionals; provide a forum for the discussion, debate, and resolution of aquatic resource issues within Virginia; and serve the Commonwealth by providing expert scientific knowledge to allow for informed decisions concerning the use and development of the state's natural resources. Check us out at our website: http://sdafs.org/vcafs/

The Chapter awards the **Robert E. Jenkins Undergraduate Scholarship** and the **Robert D. Ross Graduate Scholarship** annually. In addition we recognize biologists and conservationists. **Professional Fisheries Biologist Award:** Given to a professional fisheries biologist based on either a number of years of significant contributions to the field of fisheries science or on the basis of a single very significant contribution during the calendar year. **Natural Resource Conservationist Award:** Given to a citizen or non-fisheries professional who has demonstrated outstanding protection or enhancement of aquatic resources on their property or who has made significant contributions to the protection of aquatic resources within the state of Virginia. If you are not a member, join today.

Executive Committee

John Copeland, President
Vic DiCenzo, Past-President
Don Orth, President-elect
Mike Isel, Secretary
Dawn Kirk, Treasurer

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Program At-a-Glance

Time	Place	Activity
Tuesday		
8:30am	**Hyatt Place**	**Registration**
10:00-5:00	**Hyatt Place**	**Occupancy Models** **Fish Health Management**
6:00-10:00	**Hyatt Place**	**Social**
Wednesday		
7:45	**Hyatt Place**	**Registration**
8:10-12:00	**Hyatt Place**	**Contributed Papers**
1:30-2:30	**Hyatt Place**	**Val Kells, Invited Speaker**
2:30-3:10	**Hyatt Place**	**Contributed Papers**
3:30-5:00	**Hyatt Place**	**Business Meeting**
6:00	**Hyatt Place**	**Poster Session and Social**
Thursday		
8:30-11:50	**Hyatt Place**	**Contributed Papers**

Invited Speaker Biographical Sketch

Val Kells – Marine Science Illustrator

Val Kells is a well known freelance scientific illustrator with 30 years of professional experience. Upon completing her formal training in Science Communication and Illustration at UC Santa Cruz, she has worked closely with educational, design, and curative staff to produce accurate and aesthetic scientific and interpretive illustrations for public aquariums, museums, and nature centers. Her work has also been published in numerous books and periodicals. She specializes in illustrating marine fishes and in the past seven years has produced close to 2,000 full-color illustrations of Atlantic, Gulf of Mexico, and Pacific Ocean marine and anadromous fishes. Val is an avid angler, fish lover, and naturalist.

Virginia's fisheries associates are most familiar with her recent book, *A Field Guide to Coastal Fishes- from Maine to Texas,* by Val Kells and Kent Carpenter. For this project Val not only designed and co-wrote, she researched and created 1,079 full-color illustrations of over 1,006 marine and brackish water species. She also illustrated all 224 fish species for the recently published *Field Guide to Fishes of the Chesapeake Bay* by Edward O. Murdy and John A. Musick. This text received the Washington Book Publishers 2013 Design and Effectiveness Award. Dennis Doyle of 'Bay Weekly' in describing this text wrote: "the illustrations of artist Val Kells are nothing short of extraordinary."

Val is currently designing, co-authoring, and illustrating *A Field Guide to Coastal Fishes – from Alaska to California*, and illustrating *Tunas and Billfishes of the World.*

A Charlottesville resident, she has recently been keynote speaker for the Mid-Atlantic Marine Education Association conference, guest instructor at Virginia Polytechnic Institute, guest lecturer at Virginia Institute of Marine Science, and has given a training webinar for REEF.org. The Virginia Chapter of the American Fisheries Society is proud to welcome Val Kells to deliver "Illustrating Fishes" at 1pm on Wednesday, February 12, at our Annual Meeting, Virginia is for Fish Lovers.

Visit her website at http://valkellsillustration.com/ and order fish prints at http://www.valkellsfishprints.com/

Fish Health - Instructor: David Crosby. The morning session at The Hyatt Place at Mary Washington Fredericksburg will be classroom instruction on basics of fish health management, including facility management, clinical signs of diseases and parasites, and typical pathogens in coldwater and warmwater fishes. Laboratory instruction will be held during an afternoon session on the Mary Washington University campus, including necropsy, parasite detection, sample collection, sterile technique, and lab techniques like staining. Schedule is listed below.

10 am	Introduction to Fish Health Management
10:20	Recognizing the Clinical Signs of Diseases
10:30	Basic Pathogen Groups • Viruses • Fungus • Bacteria • Parasites Specific Pathogens • *Aeromonas salmonicida* • *Gyrodactylus* • ERM • BKD Miscellaneous Pathogens
11:00 -11:30	DVD On Fish Health (Trout)
	Lunch
1:30 pm -4:30 pm	Pathology Lab 102 Jepson Science Center, Mary Washington University (see map) • Basic Anatomy • Gill and Skin Prep • Basic Micro Techniques • BKD smear • WD smear

Dr. David Crosby received his PhD in Fisheries Biology from Auburn University in 1987. He earned a MS in biology from West Georgia College (University) in 1980. Dr. Crosby also attended the University of Georgia receiving a BSA in Biological Science in 1974. Since 1993, Dr. Crosby has been the Fish Health Specialist with the Virginia Cooperative Extension at Virginia State University. He also worked for the Mississippi Cooperative Extension service, MSU in Stoneville, Mississippi as an Area Fisheries Specialist. Dr. Crosby's current duties and responsibilities as fish health specialist include: managing the fish health program at VSU which includes the fish health diagnostic laboratory for identifying and recommending

solutions to disease outbreaks, disease prevention by educating fish producers on fish health management through workshops, newsletters, and fact sheets, and fish health research on current disease problems in Virginia. Other duties include the operation of the catfish hatchery, conducting catfish production research and farm pond workshop. He has published numerous extension publications in aquaculture, water quality and fish health. As an Extension Specialist, he is interested in: the Ecology and Taxonomy of Fish Parasites; High Intensive Catfish Production Methods; and Microbial Ecology of Fish Ponds. Dr. Crosby organized a Symposium for the 5th International Conference on Recirculating Aquaculture on "Streptococcus, An Emerging Pathogen of Recirculating Aquaculture Systems. Dr. Crosby is a member of the following professional organizations: American Fisheries Society (Fish Health Section & Fish Culture Section), American Society of Parasitologist, and Helminthological Society of Washington. Currently, Dr. Crosby is the President-Elect for the Virginia Academy of Science. Contact: David Crosby, Virginia State University, P. O. Box 9081Petersburg, VA 23806 Phone: 804-524-5620 Email: dcrosby@vsu.edu

Introduction to the Design and Implementation of Occupancy Models

Instructors: Colin Shea, 931-372-6430, cshea@tntech.edu
Greg Anderson, 706-247-6462, gba@vt.edu
Tennessee Technological University & Virginia Polytechnic Institute and State University

Date/Time: 10:00 am – 4:30 pm, February 11, 2014, Hyatt Place.

Max number of participants: 30

Session 1: Review of statistical modeling and inference (10:00 am – 11:00 pm)
Session 2: Intro to occupancy estimation and modeling (11:15 am – 12:00; 1:30 – 2:30)
Session 3: Hands-on examples in Program MARK (2:45 – 4:30 pm)

- Single season occupancy models
- Multi-season occupancy models

This workshop will provide an introduction to the design and implementation of occupancy modeling approaches for natural resource monitoring. We will emphasize the importance of properly matching management objectives with sample design, as well as the influence of incomplete detection on management decision-making. The 6-hour workshop will consist of three sessions. The first session will provide a brief review of modeling and statistical concepts related to occupancy modeling. The second session will cover basic sample design considerations and methods for estimating species occurrence while accounting for imperfect detection of animals. In the third session, we will demonstrate some of the techniques discussed in the preceding sessions using real-world data and the freely available program MARK. Hands-on examples will focus on the implementation of various occupancy models using MARK, as well as interpretation of parameter estimates. The workshop is open to all, but will be targeted at students and natural resource professionals involved with planning and implementing monitoring programs in stream systems.

Target Audience: Natural resource professionals with limited exposure to occupancy modeling who are interested in species distribution modeling.

Background Required: A basic understanding of statistics is helpful, but not required.

- PowerPoint presentations, demonstration datasets, relevant literature, and instructions for downloading and installing MARK can be found at the following website: https://sites.google.com/a/vt.edu/occupancy/
- Laptops installed with Program MARK will be required. Laptops will not be provided.

Colin Shea received his B.S. in Biology at the University of Victoria, British Columbia, and his MS and PhD in Forestry and Natural Resources at the University of Georgia. He works primarily with stream fishes and freshwater mussels and has a strong interest in the use of ecological models to inform management and conservation activities. Colin currently works as a post-doctoral research associate for the USGS Tennessee Cooperative Fishery Research Unit at Tennessee Technological University.

Greg Anderson is a Research Specialist and PhD student in the Fish and Wildlife Conservation Department at Virginia Tech. He received his B.A. and M.S. at the University of Georgia. Greg works primarily with stream fishes, and his research focuses on the development and application of hierarchical models to make management and conservation decisions for rare species.

Complimentary Wi-Fi at the Hyatt Place at Mary Washington

Open your browser
Opening page will be Hyatt
Select drop down for "code"
Code is "Hyatt"

Instructions for Live-Tweeting at the Conference – Help to Share This Meeting with the Public

Go to http://twitter.com to sign up for a twitter account. It is free!
A tweet is a message sent on twitter. Each tweet is limited to 140 characters. You must be concise!
Who reads these tweets?

Anyone who follows you or who you mention with @UserName. By including @UserName in a tweet, the tweet will be visible to that user.

Anyone who searches twitter looking for tweets that contain hashtags (#example)

Include **@VCAFS** in your tweet so it shows up in our chapter twitter feed. Go to: http://sdafs.org/vcafs/ and click on the **"t"** to see the Chapter twitterfeed.
If you wish conversations to continue and be searchable on twitter, use hastags # followed by a brief topic.
You can include a link to an external website. Links are automatically shortened to 20 characters

Tuesday, February 11

8:30 Registration at Hyatt Place, Fredericksburg

10:00-5:00 **Fish Health** Meeting Place I, Hyatt Place afternoon: 102 Jepson Science Center (map)
Instructor: David Crosby
Design and Implementation of Occupancy Models. Meeting Place II & III, Hyatt Place
Instructors: Colin Shea and Greg Anderson

6:00-10:00 Social Grand Meeting Place

Wednesday, February 12

7:45 Registration

8:10 **Opening Remarks**

Bill Kittrell, Moderator

8:20 **Throw Out the Lifeline…..Throw Out the Lifeline – A Conversation about Safety.** *Tom Wilcox*

8:40 **Overview of Atlantic Sturgeon Research in the James River, Virginia.** *Matthew Balazik*

9:00 **Habitat use by Young-of-year Roanoke Logperch in the upper Roanoke River.** *Jane Argentina* (grad. student)

9:20 **Diversity-production relationships of fish communities in Appalachian streams.** *Bonnie J.E. Myers* (grad. student)

9:40 **Back to the Basics: Identifying Biases and Knowledge Gaps in Life-History Studies for USA and Canadian Crayfishes.** *Michael J. Moore* (grad. student)

10:00 BREAK

Chas Gowan, Moderator

10:20 **Collaborative Conservation.** *David Mellor*

10:40 **Spawning Microhabitat Use of Bluehead Chub in a Small Virginia stream.** *Christina Bolton* (undergrad. student)

11:00 **Effects of a Stream Restoration Project on Physical Habitat, Aquatic Insects, and Fish.** *Sam Jeremenko* (undergrad. student)

11:20 **Warmwater Hatcheries Program in Virginia including Pre- and Post-renovation of King & Queen Fish Hatchery.** Chris Dahlem

11:40 **Small-scale renovations for the Montebello Fish Cultural Station/ Dept. of Game & Inland Fisheries.** *Thom Teears*

12:00 Lunch

1:30 **Illustrating Fishes** *Val Kells*, Marine Science Illustrator, **Invited Speaker**

Dan Downey, Moderator

2:30 **The acid-base status of Virginia's brook trout streams: indications of recovery and long-term damage.** *Rick Webb*

2:50 **A Tale of two trout streams: Liming projects for Little Tumbling and North Fork Stony Creeks in Appalachian Highlands of Virginia.** *L. A. House* (undergrad. student)

3:10 BREAK

3:30 Business Meeting Grand Meeting Place, Hyatt Place

5:00 Adjourn

6:00 Social and Poster Session, Tom Wilcox, Raffle MC Grand Meeting Place, Hyatt Place

Poster Presenters and Titles

Experimental assessment of Young Channel x Blue Catfish Density and Intraspecific Competition on Growth in a Pond in Virginia. *Jessica Dodds*

Effects of the Little River Dam on Adjacent Fish Communities, *Britney A. Kreiner*

Defining rare for Clinch Dace beyond "few and far between" *Michael J. Moore*

Life history of *Heterandria bimaculata* in Cusuco National Park, Cortez Department, Honduras. *Thomas Olinger*

A meristic and morphometric assessment of Roanoke bass, rock bass, and their hybrids *Brandon Plunkett*

Pugheaded and other anomalous catfish in Virginia's tidal rivers. *Joseph D. Schmitt*

Brook Trout Habitat Use, Social Interactions, and Predatory Efficiency in Various Temperature and Sedimentation Conditions. *Kyle Snow*

Atlantic Slope freshwater mussel propagation at the Virginia Fisheries and Aquatic Wildlife Center. *B.T. Watson*

Experimentation with color matching and substrate preference in juvenile brook trout (*Salvelinus fontinalis*). *Charlie Watt*

Thursday, February 13

George Palmer, Moderator

8:30 **Population Characteristics and the Impact of Regulations on the Blue Catfish Population, Kerr Reservoir, Virginia-North Carolina.** *Vic DiCenzo*

8:50 **Differences in Angler Catch and Exploitation of Walleye (*Sander vitreus*) From Virginia Waters.** *Johnathan Harris*

9:10 **Virginia's American Shad Restoration Program - Success, Failure and the Road Ahead.** *Eric M. Brittle*

9:30 **Using Mark-Recapture Sampling to Assess Populations of the Endangered James Spinymussel (*Pleurobema collina*).** *B.T. Watson*

9:50 BREAK

Christine May, Moderator

10:10 **Examination of Methods for Detecting and Resolving Passage Issues for Small, Non-Game Fish at Road-Stream Crossings**. *Andy Dolloff*

10:30 **Efficacy of Wild Brook Trout (*Salvelinus fontinalis*) Re-introductions into Two Virginia Headwater Streams impacted by a Catastrophic Climatological Event.** *Steve Owens*

10:50 **Potential for Genetic Monitoring to Detect Biotic Impacts of River Habitat Fragmentation. and Land-Use Change.** *James H. Roberts*

11:10 **Status of the Redbelly Daces (Genus *Chrosomus*) in Virginia.** *Mike Pinder*

11:30 **Where are the ELOHA's in Virginia Rivers?** *Donald Orth*

Contributed Paper Abstracts

Throw Out the Lifeline…Throw Out the Lifeline – A Conversation About Safety

TOM WILCOX, DGIF/DOF COMMUNICATION TEAM

Virginia Department of Game and Inland Fisheries
4010 West Broad Street
Richmond, Virginia 23230

The Virginia Department of Game and Inland Fisheries (DGIF) is developing an approach plan to improve workplace safety when employees are conducting high-risk operations (i.e. operating heavy machinery, electrofishing, etc.). An inter-disciplinary team was developed and guided by leadership of the DGIF-Bureau of Wildlife Resources. The approach also involved conversations with National Park Service, Missouri Department of Conservation and the Arizona Game and Fish Department to determine best practices and lessons learned.

The plan is built under 3 pillars – **prevention, mitigation, and response**. Prevention includes the development of the Job Hazard Assessment (JHA) and tailgate safety briefings which includes components such as start/stop times, PPE evaluations, on site-risk assessments, etc. The mitigation component includes a check-in/out procedure and the use of other tools to further ensure the safety of DGIF staff when working alone and/or conducting high-risk activities. The DGIF Dispatch Center will be the place holder for communication around highest-risk activities. An emergency plan, including a welfare check procedure, is being developed to support DGIF's response capabilities. Improved safety requires a shift in the way we think and will be incremental over time as we throw out the lifeline!

Overview of Atlantic Sturgeon Research in the James River, VA.

MATTHEW BALAZIK[1], STEPHEN MCININCH[1], GREG GARMAN[1], ALBERT SPELLS[2]

[1]1000 West Cary Street Richmond VA, Phone 804-828-7202, Fax 804-828-1622
[2] 1111 Kimages Road Charles City, VA, Phone 804-829-2421, Fax 804-829-6067

The Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* is a large-anadromous fish that inhabits rivers and the ocean along North America's Atlantic slope. Mostly due to over-harvest back in the late 19th century all populations collapsed. In 2012 all populations in the US were listed as either threatened or endangered under the Federal Endangered Species ACT. The James River was considered functional extirpated at the end of the 21st century. Over the past decade the James River population has been rebounding likely due in large part to harvest restrictions. Because of low-population numbers very little was known about Atlantic sturgeon life history in the James River. The one thing that became apparent was that what little we thought we knew was wrong. Here we present an overview of our current research and findings.

Habitat Use by Young-of-Year Roanoke Logperch in the Upper Roanoke River

JANE ARGENTINA, PAUL ANGERMEIER, JAMIE ROBERTS

[1] Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061
[2] U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA 24061

Habitat-use models and population assessments of riverine fishes often focus on adults, though ontogenetic habitat shifts are common and younger life stages strongly influence population dynamics. Roanoke logperch (*Percina rex*) have been monitored annually Roanoke River since 1997, but efforts have focused on adult populations in swift riffle-run habitats. Little is known about habitat use by young-of-year (YOY) logperch or how it changes from spring to fall, when they presumably shift from low-velocity river margins into deeper, swifter waters. We quantified habitat associations and timing of habitat shifts by sampling a wide range of river-margin habitats in Roanoke River bi-weekly during May-October 2013. We quantified habitat availability and YOY logperch in each sampled habitat. We collected 33 YOY in 19 seine hauls across all sites and dates; all but three individuals were collected at the site furthest downstream. YOY prefered habitat patches with sand, small gravel, and American water willow, with flows <0.3 m/s and depth between 0.1-0.6 m. Individuals increased from 31 mm SL in July to 65 mm SL in September; water depth and velocity in occupied patches were positively correlated with body size. Future habitat suitability models should be expanded to include preferences of all life stages.

Diversity-Production Relationships of Fish Communities in Appalachian Streams

BONNIE J.E. MYERS[1], C. ANDY DOLLOFF, ANDREW L. RYPEL

Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061-0321

Relationships between species richness and ecological production rates are increasingly thought to be pervasive across the globe. Yet diversity-production relationships have not been extensively explored for freshwater fish communities even though fisheries production is a key ecosystem services to humans. The purposes of this study were to 1) evaluate the diversity-production relationship in freshwater stream ecosystems across the Appalachian Mountain range; 2) examine how diversity-production relationships may vary across stream thermal classes; and 3) compare diversity-production relationships of stream fish assemblages to published relationships for other taxonomic groups. Empirical estimates of annual production rates were derived via field sampling on 25 stream fish assemblages. Community fish production ranged from 0.15 to 6.79 g m^{-2} yr^{-1} and community fish P/B from 0.21 to 1.07. Species evenness in production differed significantly across cold-water, cool-water, warm-water, and the extreme northern streams when production was used as the variable of interest (evenness in production declined with stream temperatures). Community fish production was significantly and positively predicted by species richness alone (R^2=0.38, *P*=0.001). Furthermore, the relationship increased in strength and significance after accounting for potential covariates of production (e.g., habitat quality, R^2=0.54, *P*=0.0004). The diversity-production relationship for stream fish communities was comparable to other studies, but demonstrated one of the highest slopes on record. Management of freshwater fisheries for biomass production may be more closely linked to conservation of fish diversity than previously thought. Further studies of diversity production relationships are encouraged for other fish and ecological communities.

Back to the Basics: Identifying Biases and Knowledge Gaps in Life-History Studies for USA and Canadian Crayfishes.

MICHAEL J. MOORE[1], ROBERT J. DISTEFANO, ERIC. R. LARSON

[1]Department of Fish and Wildlife Conservation, Virginia Tech
Blacksburg, Virginia 24061-0321

Life-history knowledge is central to basic and applied ecology, but recent reviews show that knowledge of life histories of many freshwater invertebrates is incomplete because of difficulty in conducting such studies or a general decline of interest in natural-history research. We review and summarize published life histories for crayfishes native to the USA and Canada. We document the rate of accumulation of crayfish life-history knowledge and biases and gaps in life-history knowledge by taxonomic group, geography, habitat preference, and conservation status. A total of 78 published studies (59 papers; several included life history information for multiple species) covering 42 (12%) of the 347 USA and Canadian crayfishes recognized as of 2007 met our criteria for crayfish life-history studies. Life-history studies were lacking for crayfishes of conservation concern and stygobitic or primary burrowing-habitat specialists. Life-history knowledge is relatively complete for low-diversity freshwater ecoregions of northern and western North America, but lacking for high-diversity freshwater ecoregions of the southeastern USA. From 1972 to 2007, an average of 3.40 new crayfish species/y were described, whereas 0.63 species/y were added to the list of crayfishes with published life-history studies. Thus, taxonomic knowledge is expanding faster than ecological or life-history knowledge of these same species, inevitably limiting our ability to manage and conserve them. We conclude with suggestions for increasing publication of crayfish life-history studies, and priorities for regions, taxonomic groups, and life-history traits that require urgent attention. We also present a database of existing crayfish life-history studies for researchers interested in life-history questions and to provide a foundation for traits-based inquiries into crayfish macroecology and applied questions in conservation like the prediction of extinction and invasion risk.

Collaborative Conservation

DAVID MELLOR, ALYCIA CRALL

Virginia Tech, Blacksburg VA
Virginia Master Naturalists

Citizen science provides excellent opportunities for motivated, non-professional scientists and members of the public to work with professional scientists and environmental managers to conduct research that addresses environmental issues that are of interest to both groups. However, the ability of experts to develop and sustain a successful citizen science project may be limited since the needs of the researchers may not fully overlap with the concerns of the non-professionals. Therefore, a need exists to foster new models of citizen science that promote collaboratively developed projects, which have the potential to increase motivation, learning, and engagement from participants, but are scientifically rigorous and allow for broad research implications. In this talk, we will present the development of an online citizen science collaborative space intended to support interaction between scientific professionals, environmental managers, and the public. The purpose of this space is to (1) train citizen scientists in ecosystem ecology, (2) collaboratively define environmental issues of concern or scientific interest, and (3) co-develop citizen science research and adaptive management plans. Our program uses an adaptive management framework to facilitate discussion between project managers and volunteers on the current and desired state of the system, plan for a management action, implement a project, evaluate its effects, and share the results, which can then be used to inform subsequent management actions. Three projects that are currently in process will be highlighted as case studies.

Spawning microhabitat use of Bluehead Chub in a small Virginia stream.

CHRISTINA BOLTON, BRANDON PEOPLES, EMMANUEL FRIMPONG

Department of Fish and Wildlife Conservation, Virginia Tech
Blacksburg, VA 24060

The purpose of this project was to assess the spawning microhabitat use of bluehead chub *Nocomis leptocephalus* on the North Fork of the Roanoke river. Average current velocities (ms^{-1}) and depths (cm) of transects at nests (n=28) were compared to paired transects one meter upstream. Approximately 100 substrate particles were measured randomly from four nests and compared to 100 particles from the surrounding substrate at a relatively forested site (n=2 nests) and a relatively silted (n=2 nests). Logistic regression indicated that current velocity was the only significant factor (p=0.092) negatively affecting nest presence. Paired t-tests showed that chubs prefer substrate particles approximately two millimeters smaller than available gravel both before (p=0.0001) and after (p=0.0006) accounting for land use differences. Sizes of substrate particles were used by chubs were larger in the silted site than in the forested site (=0.0187); this was not related to the site-wise differences in diameters of available substrate (p>.10). This implies that bluehead chubs might be reproductive habitat specialists. Selecting larger stones to build their nests in a silted site may improve oxygenation.

Effects of a Stream Restoration Project on Physical Habitat, Aquatic Insects, and Fish

SAM JEREMENKO, CHARLES GOWAN

Department of Biology, Randolph-Macon College
Ashland, Virginia

In Fall, 2010, a $250,000 stream restoration project was completed on 1200 linear feet of Mechumps Creek, a first-order stream that runs through Ashland, Virginia. Aquatic habitat in the creek was degraded by erosion caused by high volumes of storm water runoff generated by urban development. We measured channel cross-sections, physical habitat (width, depths, velocities, substrate, and cover), fish populations, and aquatic macroinvertebrate communities one year before restoration and then for each of three years after. Cross-sections documented severe erosion (downcutting and widening) before restoration, and confirmed that the newly-constructed channel was stable. Compared to before restoration, the post-restoration channel was narrower and shallower on average, and the variation in velocity was higher. Total fish abundance increased, as did overall fish species diversity. Species adapted to riffle and run habitat, which was largely absent prior to restoration, increased significant, and those adapted to very deep pools declined. Stream health scores based on aquatic macroinvertebrate communities increased due to improved habitat conditions, but remained low due to poor water quality.

Warmwater Hatcheries Program in Virginia including Pre- and Post-renovation of King & Queen Fish Hatchery

CHRIS DAHLEM

Department of Game & Inland Fisheries, King & Queen Fish Hatchery
Stevensville, Virginia 23161

I. Numbers of warm/cool water fish produced in VA in 2013, and the cost to produce them. Production requisitions for same, for 2014. Hatchery staffing. Hatchery in-house projects and capital projects, both newly completed and in the pipeline.

II. Pre-renovation King & Queen Fish Hatchery conditions resulting from depreciation, deferred maintenance, neglect, and obsolescence. Fish production capability in said condition, during the last two full years immediately preceding renovation construction. Post renovations infrastructure at King & Queen Fish Hatchery. Fish production at King & Queen Fish Hatchery during 2012 and 2013 illustrates improved capabilities. Worth the renovation investment? Can we meet future warm/cool water fish requisitions without investing in additional hatchery renovations?

Small-Scale Renovations for the Montebello Fish Cultural Station/ Dept. of Game & Inland Fisheries

THOM TEEARS

Montebello Fish Cultural Station Superintendent
Virginia Dept. of Game & Inland Fisheries
359 Fish Hatchery Lane
Montebello, VA 24464

The Montebello Fish Cultural Station in Nelson County Virginia has undergone recent small scale renovations in order to respond to disease issues in fish stocks. In the autumn of 2012, Brook Trout from Montebello FCS were determined to have Bacterial Kidney Disease (BKD), Infectious Pancreatic Necrosis (IPN) and Whirling Disease. In response, bio-security measures were implemented and plans for disinfection of the facility were initiated. Native brook trout collected from the creek used as a supplemental water source for the hatchery were found to be carriers of these diseases. As a result, the hatchery was disinfected and an ultraviolet (UV) system was installed to sterilize the incoming creek water. In addition, the raceways were resurfaced to reduce water losses, thereby reducing the need for this supplemental water source. This presentation summarizes the renovations to the facility and the present and future impacts of those changes. This presentation also summarizes operational changes such as production level increases due to trout system management, improved fish culture practices, updated technology and material improvements.

The Acid-Base Status of Virginia's Brook Trout Streams: Indications of Recovery and Long-Term Damage

RICK WEBB

Department of Environmental Sciences, University of Virginia
Charlottesville, Virginia 22903

In recent decades, sulfur emissions from power plants have declined dramatically in response to Clean Air Act requirements. From a peak level in the 1970s, sulfur emissions have now declined to the lowest level since 1900. This reduction in emissions has resulted in reduced sulfur deposition to Virginia's mountain watersheds. Examination of quarterly sample data obtained for 64 regionally distributed brook trout streams from 1987 to 2011 by the Virginia Trout Stream Sensitivity Study provides evidence for limited recovery from stream acidification in response to the decrease in sulfur emissions and deposition. Although sulfate concentrations declined in the majority of sites, this did not result in a general recovery of acid neutralizing capacity (ANC). Instead, ANC declined in many streams, especially in the streams associated with base-poor siliciclastic bedrock. The lack of recovery for these streams can be attributed to a decline in concentrations of base cations, evidence for cumulative damage to watershed soil by past exposure to acidic deposition. It can be assumed that many additional streams throughout the region are also exhibiting little or no recovery in response to the recent reductions in acid-forming emissions and acidic deposition, because siliciclastic bedrock types are prevalent in the central Appalachian mountains.

A tale of Two Trout streams: Liming Projects for Little Tumbling and North Fork Stony Creeks in the Appalachian Highlands of Virginia

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The water chemistry of two Appalachian Mountain streams in southwest Virginia, Little Tumbling Creek (LTC) and North Fork Stony Creek (NFSC), was assessed for this study. Both streams have good coldwater physical and thermal habitat, but discharge from watershed geology with little natural carbonate bearing minerals. One stream (LTC) is located on property owned by the Virginia Department of Game and Inland Fisheries (VDGIF), while the other (NFSC) is entirely on United States Forest Service (USFS) property. The combination of the near absence of natural buffer and acid precipitation result in low pH and other water quality values for both streams, which in turn results in poor trout biomass and recruitment. Single point, single application of a natural base material ("liming") near the headwaters of streams has been studied by our group as an inexpensive means of "improving" water chemistry habitat for durations of three to six years. In January 2012 high calcium limestone (60 tons) was introduced into LTC as part of a VDGIF remediation project. A USFS sponsored remediation of NFSC has since been proposed. The purpose of the present study was to evaluate stream water chemistry for LTC pre/post limestone treatment and upstream/downstream to establish the effectiveness of the treatment for improving water chemistry. These results were used to determine the amount of limestone necessary for the NFSC liming. Physical size, watershed geology and discharge values have been evaluated for the streams and found to be quite similar. Water samples were collected and analyzed for pH, acid neutralizing capacity (ANC), and Ca^{2+} concentration. The *average* pH/ANC/Ca values of LTC samples to date upstream and downstream of the liming site were 4.90/-10.5/46.2 and 5.67/8.9/74.3, respectively. Although the limestone did improve water chemistry, the values have been lower than target values and indicate that additional limestone must be added. The average pH/ANC/Ca of NFSC samples was 5.39/-4.3/1.6. A limestone consumption half life (1.62 yr^{-1}) has been determined for the LTC liming. The results were used to recommend that 40 and 100 tons of limestone be added to LTC and NFSC, respectively for acid mitigation.

Population Characteristics and the Impact of Regulations on the Blue Catfish population, Kerr Reservoir, Virginia-North Carolina

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Kerr Reservoir, Virginia-North Carolina annually produces Blue Catfish *Ictalurus furcatus* > 40 kg and the current world record was caught in June 2011 (65 kg). Despite the popularity and success of this fishery, little information existed on collection techniques, population characteristics, and population dynamics. Our research objectives were twofold. First, we evaluated the size structure, condition, growth, and mortality of the blue catfish population in Kerr Reservoir. Using these data, we then simulated the effects of various length restrictions on number harvested, yield, and the number of trophy blue catfish (> 813 mm) in the population. We collected 647 blue catfish using jug lines and gill nets in 2011 and 2012. Proportional size distribution (PSD) was 44, while PSD of preferred-sized fish (PSD-P) and memorable-sized fish (PSDM) was 4 and 1, respectively. Mean relative weight was 83 and positively related to length. Blue catfish achieved quality length (510 mm) in about 8 years and the oldest fish we aged was 18. We estimated total annual mortality rates based on gill-net and jug-line sampling to be 23 and 14% which were similar to mortality rates of blue catfish in other systems. These data suggest that Kerr Reservoir blue catfish can be classified as having high recruitment, slow (and variable) growth, and low mortality. We modeled current regulations as a 300-mm minimum-length limit (MLL), and also simulated the effect of 510-mm and 813-mm MLL's. Compared to a 300-mm MLL, we predicted a 33% reduction in harvest but a 50% increase in the number of trophy blue catfish with a 510-mm MLL. Harvest would be essentially non-existent under the 813 mm MLL and at low levels of fishing mortality, and yield was lower as well. Even under the 813-mm minimum size limit, fish larger than 813 mm composed less than 3% of the population. We recommend continuing current blue catfish harvest regulations: a 20-fish daily creel limit, with no more than one fish longer than 813 mm per day

Differences in Angler Catch and Exploitation of Walleye (*Sander vitreus*) from Virginia waters

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Walleye (*Sander vitreus*) were collected during late winter – early spring in 2008-2011 at seven sites across Virginia to evaluate angler catch and exploitation. A total of 3,116 walleye were tagged with FD94 T-bar Floy tags at four small impoundments (< 200 ha), two large impoundments (> 200 ha), and the New River during the course of the study. Anglers were offered a US$20 reward for the return of each tag, and 530 tags (17%) were returned. Anglers were successful at catching walleye in all waters with adjusted annual catch rates ranging from 15-61% (mean of 29%). On average, catch rates were the highest in small impoundments (34%), followed by the New River (27%) and large impoundments (21%). Annual exploitation ranged from 2-29% (mean of 12%). Mean exploitation at small and large impoundments (~ 14% at both) was considerably higher than the New River (4%). Mean TL of walleye harvested from small impoundments (462 mm) were smaller than those harvested from large impoundments (508 mm) or rivers (507 mm) ($P < 0.001$), indicating the potential of growth overfishing in these smaller waters.

Virginia's American Shad Restoration Program – Success, Failure and the Road Ahead

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Over two decades ago, the Virginia Department of Game & Inland Fisheries (VDGIF) took on the task of trying to help restore the American shad (*Alosa sappidissima*) population in the Chesapeake Bay. Restoration efforts were needed due to the loss of habitat resulting from the blockage of access to spawning grounds, mortality from harvest and environmental factors. VDGIF collaborated with state and federal agencies, private contractors and non-governmental agencies within the Chesapeake Bay watershed to develop the program. A broad spectrum of restoration efforts were implemented including stocking fry produced from eggs and milt taken from spawning adults. Fry were marked with oxytetracycline and then released near historical spawning sites. Early stocking efforts showed promising results with stocked fish returning to spawning grounds each year. Then in the mid-2000s, monitoring efforts showed the number of returning adults was highly dependent upon stocked fish (high hatchery prevalence), however the overall number of fish was not increasing. Additional data has shown variable but low numbers American shad returning to the Bay since the program was initiated. In the past few years, discussions among VDGIF's biologists and managers have centered around the continuation of the program, how to measure success or failure and when do we make the decision to discontinue the program.

Mark-Recapture Sampling to Assess Populations of the Endangered James Spinymussel (*Pleurobema collina*)

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Determining the viability of freshwater mussel populations is necessary in developing and implementing conservation plans. However, data regarding population sizes and parameters such as survival and recruitment are lacking. Mark-recapture sampling allows for estimation of these parameters, while also accounting for variable detection probabilities. The federally endangered James spinymussel (*Pleurobema collina*) is predominantly found in the James River Basin in Virginia and West Virginia and a significant population was discovered in Little Oregon Creek, Craig County, VA, in 2010, allowing for mark-recapture sampling. Sampling involves three surveyors crawling on hands and knees using the naked eye or a viewscope to flag all mussels within a 100-m reach, along with random tactile surveys by hand raking, with all mussels marked with a Hallprint™ tag. Two sections were sampled with quadrat excavation for comparison. A total of 2,056 James spinymussel have been tagged with 2,879 recaptured at least once. Population estimates in 2010 using program MARK and CAPTURE ranged from 1,769-1,909, with quadrat estimates not significantly different. Detection probabilities varied by section and date from 10-30% and were similar to those determined from quadrat sampling, both lower than expected. Population estimates from 2,010-2,013 using MARK ranged from 751-1,677 by year but averaged 2,378 over all years, indicating possible assumption violations or sampling inconsistencies. Survival over one year averaged 87%, which may affect population estimates as recruitment cannot yet be determined. Sampling will occur thru at least 2015 and has been extended to six other populations.

Examination of Methods for Detecting and Resolving Passage Issues for Small, Non-game Fish at Road-Stream Crossings

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We used a combination of techniques to monitor fish movement at road/stream crossings on the Daniel Boone National Forest, KY. In 2010, we used mark-recapture and collected fin clips for genetic analysis to assess passage at 20 crossings; at 3 of the crossings we also marked individual fish with RFID tags and continuously monitored for movement from March – October. Mark-recapture provided relatively little useful information for assessing fish passage. In contrast, we detected differences in fish passage among crossings using RFID tagging and genetic approaches. RFID monitoring provided detailed information on the timing and magnitude of fish movement and again showed less movement through difficult crossings.

Fish passage survey results show that the need for passage replacement or improvement projects far exceeds available budgets. To provide managers with tools to prioritize fish passage improvement projects, we developed The Crossing Assessment Decision Support System (CADSS) , a custom add-in for ArcMap that uses passage survey results, land ownership, species distributions, and stream network metrics to inform fish passage improvement projects. CADSS can be used to prioritize passage projects among watersheds, among crossings within individual watersheds, and to find data gaps in existing passage datasets.

Efficacy of Wild Brook Trout (*Salvelinus fontinalis*) Re-Introductions into Two Virginia Headwater Streams Impacted by a Catastrophic Climatological Event

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Abstract – A catastrophic weather event during June 1995 produced as much as 60 cm of rain over five days resulting in severe flooding and massive debris flows. Wild Brook Trout (*Salvelinus* fontinalis) were extirpated as a result of significant habitat alteration that occurred in Garth Run and Kinsey Run, VA. Ten years post storm event, wild Brook Trout had failed to re-colonize these streams from elsewhere within the watershed as habitat improved. Approximately, 100 wild Brook Trout of various sizes were collected from a neighboring watershed and introduced into both streams during September 2008. Successful reproduction was documented in both streams the following June. Brook Trout numbers continue to grow in both streams five years post introduction, documenting the efficacy of utilizing small stockings of wild fish into suitable headwater streams as a restoration tool.

Potential for Genetic Monitoring to Detect Biotic Impacts of River Habitat Fragmentation and Land-Use Change

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Human alterations of the landscape profoundly affect the structure and function of rivers. Population-genetic data are an underutilized tool for testing hypotheses about combined influences of land use and habitat fragmentation on the population dynamics of stream biota. We examined spatial patterns of genetic diversity and differentiation in redline (*Etheostoma rufilineatum*) and greenside darters (*E. blennioides*), two common stream fishes of the upper Tennessee River basin, a region characterized by extensive hydrologic alteration and land-use change. For both species, Random Forest multiple regression models indicated that genetic differentiation was higher, and genetic diversity lower, in streams isolated upstream of dams and reservoirs, suggesting that isolated streams harbored smaller or more variable populations. Indices of urban and agricultural land use were calculated for watersheds surrounding darter sample sites. Influences of land usage varied somewhat among genetic response variables and between species. However, indices of urbanization (% urban land use, % impervious surfaces, and road density) were consistently negatively related to genetic indices of darter population size and stability. Moreover, these genetic signals were detected at relatively low levels of urbanization, suggesting that genetic monitoring could provide early warnings of biotic impacts, thereby complementing conventional methods of biological monitoring.

Status of the Redbelly Daces (Genus *Chrosomus*) in Virginia

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The redbelly daces of the genus *Chrosomus* (formerly synonymized with *Phoxinus*) are some are the most brilliantly colored cyprinids in North America. Although a few are widespread and abundant, the genus exhibits a high degree of endemism with the majority being rare and localized. Since publication of Jenkins and Burkhead's1994 book, Freshwater Fishes of Virginia, the number of *Chrosomus* species in the Commonwealth has risen from two to four. These include the mountain redbelly (*C. oreas*), Tennessee (*C. tennesseensis*), blackside (*C. cumberlandensis*), and Clinch (*C.* sp. cf. *saylori*) daces. Among these, three are restricted to the headwater streams of southwestern Virginia and demonstrate some level of imperilment. Populations in occupied streams are small and fragmented by habitat loss and degradation. Overexploitation by bait collectors and the introduction of non-native congeners also pose a threat to their survival. Since 1994, management and conservation efforts have been directed towards researching their status, distribution, and life history. Because many dace streams are remote and undersampled, new techniques such as environmental DNA markers will be tested to elucidate species presence. Additional research, along with environmental protection, regulations and education will be necessary to protect and recover this unique group of Virginia's ichthyological community.

Where are the ELOHA's in Virginia Rivers?

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The protection of the values associated with flowing waters has been historically hampered by normative science (if there was any science at all), narrowly defined state water policies, poor implementation of protective measures, and arcane and difficult acronyms, such as WUA, PHABSIM, IFIM, and many others. Enter ELOHA, another acronym; this one stands for Ecological Limits on Hydrologic Alteration. ELOHA is a holistic framework for managing stream health and requires (1) building a hydrologic foundation which consists of gathering flow data and modeling to build or develop baseline hydrographs; (2) classification of natural flow regimes; (3) determination of flow alteration; (4) development of causal relations between alterations in flow regime and the responses of aquatic communities and; (5) involving stakeholders to determine societal values, management needs and acceptable ecological conditions. The Commonwealth of Virginia developed a systems-based approach to integrated watershed management as outlined by the U.S. EPA's Healthy Watersheds Initiative (HWI). The pilot study which followed the ELOHA framework was completed by TetraTech in 2012 and provides a "first-look" at responses of aquatic communities to alteration of the flow region. The presentation will address the question of where and whether these limits are evident and defensible for managing water withdrawals and reservoir releases.

Poster Abstracts

Experimental Assessment of Young Channel x Blue Catfish Density and Intraspecific Competition on Growth in a Pond in Virginia

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Previous research has found that channel catfish *Ictalurus punctatus* growth is often density dependent and at a young age they may compete with bluegills *Lepomis macrochirus* for food. While overstocking catfish could lead to intraspecific competition, biomass will often be low if they are not stocked regularly. We experimentally assessed the growth of channel x blue catfish *Ictalurus furcatus* by stocking them in varying densities with and without bluegills in 1.0-m^3 cages within a pond in Virginia and monitored growth and diets. Although growth was not significantly different between catfish stocked with different bluegill densities, catfish stocked alone in lower densities grew larger and were in better condition than when stocked alone in high densities. Knowledge on catfish-bluegill competition and catfish intraspecific competition may allow for adjusting stocking densities to enhance growth of either species in small impoundments.

Effects of the Little River Dam on Adjacent Fish Communities

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Originally licensed in 1933, the Little River Dam is a 293 feet wide and 58 feet high concrete hydroelectric dam owned by the Appalachian Power Company and located in the Kanawha River basin near Radford, Virginia. Creation of the dam resulted in a 350 acre reservoir that serves local anglers since the addition of a boat ramp. As dam relicensing approaches in 2019, it is important to balance the ecological integrity of the river with energy needs and local recreational opportunities. During the fall of 2013 electrofishing surveys were performed on the reservoir, upstream portions of the Little River, and the area leading up to the confluence with the New River by Claytor Dam. Data was used to compare altered backwater fish communities with tailwater portions and more normalized riverine conditions downstream. The reservoir community has fewer cyprinids and catostomids than the upstream unimpounded segments. Dominant fish in the reservoir community were Common Carp *Cyprinus carpio* and White Sucker *Catostomus commersoni*. The tailwater segment contained a more diverse fish assemblage, including numerous game fishes and a surprising number of walleye *Sander vitreus*. The reservoir fisheries potential can be enhanced while balancing the needs for hydroelectric power production.

Defining rare for Clinch Dace beyond "few and far between"

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In 1999, a new species of minnow, Clinch Dace (*Chrosomus sp. cf. saylori)* was discovered in the Tennessee drainage of Virginia. The species is listed as a Federal Species of Concern and on Virginia's Wildlife Action Plan as Tier II- Very High Conservation Need. Previous studies on Clinch Dace identified occupancy at 300-m subreaches; however much of the putative range of Clinch Dace remains unsampled. Further, while within-stream subpopulations are, on average, less than six individuals, the global occupancy of Clinch Dace has not yet been determined. Here, we extrapolate from previous collection records to estimate total population size and the potential range of Clinch Dace in Virginia. From this, we determine that Clinch Dace could occupy several additional kilometers of stream; however, the distribution remains limited to only eight small tributaries to the Clinch River. Even under optimal conditions, our predictions of Clinch Dace population size is critically low and species viability remains questionable. The combination of fragmented populations and low species abundance makes population collapse an immediate concern.

Life history of *Heterandria bimaculata* in Cusuco National Park, Cortez Department, Honduras

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This study examined age, growth, and reproduction *Heterandria bimaculata* (Poeciliidae) in Cusuco National Park (CNP), Cortez Department, Honduras. Maximum ages observed were 2^+ in females and 1^+ in males. The overall sex ratio was 1:1.16 (male: female), which was not significantly different from 1:1. Females grew larger and lived longer than males. Females grew faster during the first year of life, but males grew faster in the second year. Maximum total length of females and males were 91 mm and 53 mm, respectively; maximum weight of females and males were 9.96 g and 1.85 g, respectively. Embryo counts ranged from 7 to 89, averaging 41 (±2.9) and was positively related to total length. Egg diameter decreased with time from fertilization. These findings differ from the only other study on the biology of *H. bimaculata*. Differences may be attributable to different environmental conditions or predation pressure.

A Meristic and Morphometric Assessment of Roanoke Bass, Rock Bass, and Their Hybrids

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The Roanoke bass (*Ambloplites cavifrons*), a sport fish native to several Atlantic-slope drainages of Virginia and North Carolina, has experienced population declines and extirpations over the past century, in part due to competition and hybridization with introduced rock bass (*A. rupestris*). We sampled *Ambloplites* specimens from rivers throughout the historical range of Roanoke bass, in order to determine the present status of the species and the extent of its hybridization with rock bass. For comparison, we also included known rock bass specimens from nearby Gulf-slope drainages. Specimens were examined for six meristic and seven morphometric characters and these data were analyzed using multivariate statistics. Results showed clear separation of the two species in multivariate space, and most rivers appeared to contain one species or the other, but not both. Furthermore, most individuals could be accurately statistically assigned back to their putative species, and in many cases, to their river of capture. However, some rivers exhibited ambiguous classification and appeared to contain both species and/or hybrids. These results will be compared to upcoming genetic analyses, which will be used to confirm species identities and corroborate hybrid assignments. Outcomes of the study will help managers assess the status of Roanoke bass and prioritize rivers for Roanoke bass restoration and rock bass eradication.

Pugheaded and Other Anomalous Catfish in Virginia's Tidal Rivers

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Pug-headedness in fish is an anomalous osteological condition often resulting in deformed maxilla, pre-maxilla, and/or infra-orbital bones, though the severity of this condition can vary. Pug-headedness has been shown to interfere with foraging activities, often reducing growth and survival. Pug-headedness has been reported in many different families of teleost fish, though most records of this deformity have been based on single specimens. Pug-headedness has been found to be extremely rare in estuarine systems (Dahlberg 1971), yet we captured numerous specimens of pug-headed blue catfish *Ictalurus furcatus* from the tidal Rappahannock River. Here we will describe the first documented occurrence of pug-headedness in blue catfish and will explore the possible causes of this deformity. In addition, we will describe instances of pigmentation anomalies found in both longnose gar *Lepisosteus osseus* and blue catfish from the tidal Pamunkey River.

Brook Trout Habitat Use, Social Interactions, and Predatory Efficiency in Various Temperature and Sedimentation Conditions

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Streambed sedimentation is a persistent cause of impairment to the ecological condition of streams in the United States. The objectives of this study were to investigate the effects of fine sediment deposition on: 1) streambed cover use by brook trout during simulated winter flood conditions, 2) behavioral interactions among brook trout in low flow conditions, and 3) the predator-prey relationship between brook trout and stoneflies. Using artificial stream channels, experiments were conducted with wild juvenile brook trout and stoneflies collected from the North Fork Tye River in Nelson County, VA. Preliminary results indicate that: 1) brook trout did not use streambed cover as a velocity refuge, 2) as fine sediment increased, streambed cover use by brook trout decreased, which appeared to drive an increase in aggressive interactions between individuals that is greater at colder temperatures and decreases throughout the day, and 3) as fine sediment increased, stonefly survival decreased in the presence of brook trout predation. These results suggest that deposition of fine sediment has potentially adverse effects to freshwater stream ecosystems, causing stress to fish and altering the dynamics of the stream food web.

Atlantic Slope Freshwater Mussel Propagation at the Virginia Fisheries and Aquatic Wildlife Center

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Over the past decade, propagation of freshwater mussels has become a vital component in the effort to conserve and recover this imperiled fauna. However, little effort has been directed at the Atlantic Slope fauna, most likely since the number of threatened and endangered species is not as numerous as other major drainages like the Ohio and Tennessee. To help fill this gap, the Virginia Department of Game & Inland Fisheries and the U.S. Fish & Wildlife Service partnered to start the Virginia Fisheries and Aquatic Wildlife Center (VFAWC) at Harrison Lake National Fish Hatchery in 2007. Over the past six years, VFAWC has worked with nine species, producing nearly 3 million mussels. Starting at just over 12,000 juveniles in our first year of production in 2008, we produced nearly 1.1 million in 2013. While most species propagated are not threatened or endangered, all are identified as Species of Greatest Conservation Need in Virginia and VFAWC is the only facility to propagate tidewater mucket (*Leptodea ochracea*) and alewife floater (*Anodonta implicata*). Nearly 60K mussels have been released since 2009, all of which were tagged and a number of which have spawned in the wild. Work has been done without a dedicated staff as we use a mix of biologists from the Agencies and volunteers.

Experimentation with Color Matching and Substrate Preference in Juvenile Brook Trout (*Salvelinus fontinalis*)

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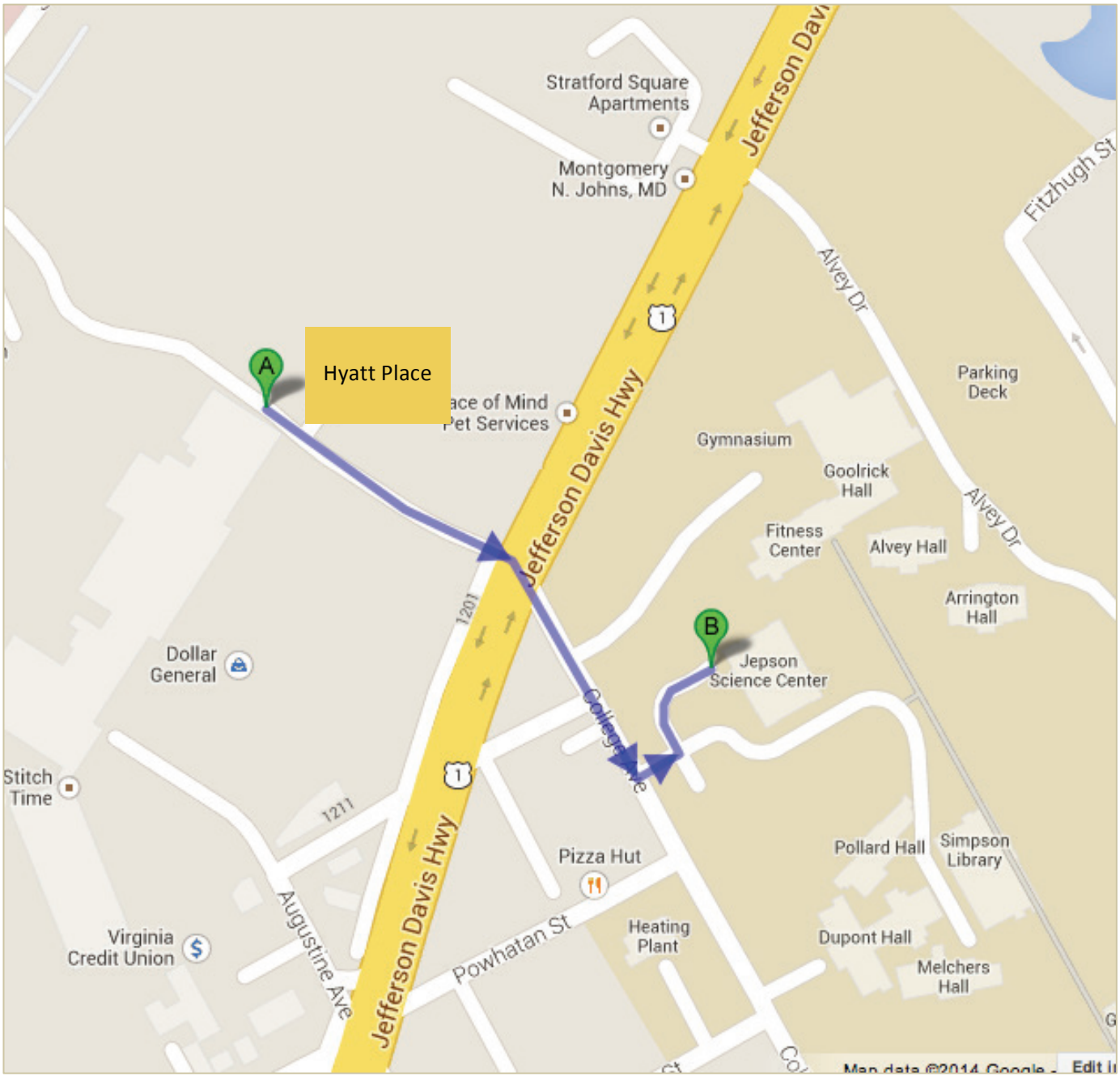
Phenotypic plasticity in fish is commonly used as a means of camouflage and as a means of intraspecific communication. Camouflage, also referred to as background matching or crypsis, is an evolutionary tactic that many species use as a defense mechanism to reduce the chance of detection by a potential predator. Experiments conducted in artificial stream channels at James Madison University with juvenile brook trout tested for the potential of color matching by varying light and dark substrates, and included treatments with isolated individuals as well as with paired cohorts to test for the effect of stress on this phenomenon. One set of experiments tested the response of individuals when only light or dark substrate was available, and then tested for a preference when both were available. The baseline or resting colors that were established for dominant and subordinate individuals in paired trials showed trends that displayed the tendency for dominant fish to match to light substrate more effectively, but results were not consistent amongst all trials. This ongoing research provides new insight into a form of camouflage not typically associated with salmonid fishes.

Map to/from Hyatt Place and Jepson Science Center at Mary Washington University



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