



**Newsletter of the Freshwater Mollusk Conservation Society**  
**Volume 16 – Number 4** **December 2014**

**Cover Story . . . . . 1**

**Society News . . . . . 2**

**St. Charles Meeting Plans . 7**

**Regional Meetings . . . . . 15**

**Upcoming Meetings . . . . . 18**

**Contributed Articles . . . . . 19**

**FMCS Officers . . . 42**

**Committee Chairs and Co-chairs . . 43**

**Parting Shot . . . . . 44**

**Below the Surface . . .**

Patricia Morrison, FMCS President

Just as the mollusks we study conduct many of their activities unseen under water, so too our Society has a lot of things happening behind the scenes and just “below the surface.” Here is a short summary of some of the important activities being conducted by your committees, officers, and volunteers.

Plans are set for our upcoming 2015 Symposium in St. Charles, Missouri (see article on page 7). Our Joint Meeting and Symposium with the Upper Mississippi River Conservation Committee will be held March 22-26, 2015. Watch for the registration activation link on our website, polish up your Abstracts and send them in by December 15! Student Travel Awards and Local Committee Volunteer Awards are available, so please encourage students to apply. Everything you need with regard to this Symposium can be found here: [http://molluskconservation.org/2015Symposium/2015\\_FMCS-Symposium.html](http://molluskconservation.org/2015Symposium/2015_FMCS-Symposium.html)

Associated with the 2015 Symposium, we need to elect new officers for our Society. Starting on page 2, the Nominations Committee presents a slate of candidates for President Elect, Secretary, and Treasurer. That article concludes with instructions on where and how you can vote for your choices. We sincerely appreciate the willingness of these candidates to volunteer to serve our Society. Please read their statements and then go VOTE !

Our Society has accepted an invitation to participate on the NiSource Mitigation Panel, a multi-discipline committee that will make recommendations on mitigation options for landscape-level benefits to endangered and threatened species affected by wide ranging natural gas development and transportation projects. Our representative, John Jenkinson, attended the first meeting of the panel in mid-October and has provided a report to help the rest of understand what this Panel is all about (see page 14).

We also were invited to participate in the Ammonia Criteria Implementation Stakeholder's Meeting held in Washington, DC at the end of October. As the States and Tribes consider adopting and implementing EPA's new aquatic life criteria for ammonia in their water quality standards, one of the key considerations has to do with the presence or probability of absence of freshwater mussels in receiving streams. The sponsors of the Stakeholder's Meeting want our expertise in conducting surveys for freshwater mussels. Your Board of Directors designated Heidi Dunn to be our representative at this meeting and agreed to provide funding for her travel expenses.

Many of you are familiar with the seminal publication which set out methodologies for the investigation and economic evaluation of mussel kills: American Fisheries Society (AFS) Special Publication 30 - "Investigation and Monetary Value of Fish and Freshwater Mussel Kills." That publication is now over 11 years old. We are collaborating with the AFS Pollution Committee to begin updating the relevant chapters on investigation protocols, costs and economic valuation guidelines, and the species-specific appendix on the replacement costs of mussels. I will be the point of contact for our Society, and will be tagging many of you as expert advisors when the time comes. The AFS Committee plans to meet in Savannah, Georgia, in January 2015.

Our FMCS Operations Manual is nearing completion and almost ready for unveiling on our website. Although this is a living document, subject to updates, it is important to document the protocols and procedures of the workings of our Society, for smooth transitions and future continuity.

We are evaluating the costs and benefits of transitioning publication of *Walkerana* to Allen Press.

Last, but not least, our ad hoc committee on revising the National Strategy is in full throttle mode -- meeting every 2 weeks via conference call -- to put together the final text of our conservation vision for freshwater mollusks. We expect a final version to be shown to the Board in February 2015!

And, of course, that's really not all. As you read through this issue of *Ellipsaria*, you will encounter many more things that FMCS committees and members are doing to understand, protect, and conserve freshwater mollusks. But you will miss a lot of it unless you look . . . below the surface.

## Society News

### FMCS Officer Election

Every other year, our Society elects members to serve in three positions: President Elect (who, after two years, goes on to serve as President for two years, then Past President for two years), Treasurer (for a 2-year term), and Secretary (also for a 2-year term). Here are the background and position statements from the 2014 suite of candidates for these elective offices.

**Candidate for President Elect****Heidi Dunn**

I was first introduced into the world of freshwater mussels in 1978 while working as a summer technician with the U.S. Fish and Wildlife Service. I have been working with this group of unique animals ever since and they continue to amaze me. When asked what I do for a living, I often reply, "I play in the mud". I really cannot think of anything I enjoy more than digging through the substrate in pursuit of a rare species or little baby mussel.

I received a BS from Purdue University in 1979 and an MS from Southern Illinois University at Edwardsville, Illinois in 1991. I was also privileged to attend Dr. David Stansbery's Malacology Class at TechAqua. I have worked as an environmental consultant since 1980, and started my own company, Ecological Specialists, Inc., in 1990. As a consultant, I work with government, private industry, and regulatory agencies conducting inventories and impact analysis for freshwater mussels and other aquatic organisms.

I am one of the founding members of the

**Candidate for Treasurer****Emily Grossman**

Ever since I was a small child, I have been interested in the natural world. I spent countless hours exploring the wooded area behind my parents' house and playing in the small stream near my grandparents' home in Wisconsin. I went on to earn B.A. and M.S. in biology, but I was only introduced to freshwater mussels a few short years ago while working for the U.S. Fish and Wildlife Service. I was given the opportunity to tag along on Iowa DNR's annual "mussel blitz" in 2011, and after that first encounter, I was hooked. My newfound interest in these often-overlooked creatures led me to a position with Ecological Specialists, Inc., where I have now worked for nearly 3 years. Here, I have had the privilege of working with and learning from Heidi Dunn while conducting mussel surveys throughout the eastern half of the country. My regular job duties include leading field crews, managing projects, and working with budgets, and I believe this experience will enable me to fulfill the duties of treasurer well.



**(Dunn, continued)**

Freshwater Mollusk Conservation Society and have served as Treasurer since its inception in 1999. I have also chaired the Guidelines and Techniques Committee, assisted with most of the symposiums and workshops, co-chaired the 2010 workshop committee, and am currently co-chair for the 2015 symposium that will take place in St. Charles, Missouri. I have watched FMCS grow from less than 100 people dedicated to freshwater mollusks with a mission of implementing a National Strategy to an international professional society with over 500 members with its own journal. The experience has been very rewarding personally and professionally.

I am honored to be nominated for the position of President-Elect. If elected, I look forward to guiding FMCS in its goals of advocating freshwater mollusks, continued growth, and implementation of the Revised National Strategy.

**(Grossman, continued)**

One of the most important lessons I have learned thus far is that for every question we answer about freshwater mollusks, many more questions remain unanswered. Although I am relatively new to the mussel world, I am excited for the opportunity to serve this organization and its members, who are instrumental in working to answer these questions. I look forward to meeting and working with officers and members alike as we work to understand and protect these animals that so fascinate us.

**Candidate for Secretary**



**Janet Clayton**

**Candidate for Secretary**



**Rebecca Winterringer**

**(Clayton)**

A native of West Virginia (WV), I obtained my BS in Biology in 1982 from Marshall University where I took every aquatic biology class that they had to offer. I received my MS in Biology from Tennessee Technological University (TTU) in 1984. After spending three years as a conservation officer in Nashville, Tennessee, I moved back to my home state in 1987 and began working for the WV Division of Natural Resources. Primarily working with aquatic insects in the Compliance and Monitoring Section, I was fortunate to be at the right place at the right time. Our group was being tasked with conducting a mussel survey and the new guy on the block was given the opportunity to go to TTU for two weeks to take Dr. Stansbery's Malacology class. He was telling my supervisor, right outside my office door, that he really didn't want to go. I immediately popped out of my door and said, "Can I?" That class was my introduction to freshwater mussels back in 1989. Shortly thereafter, I moved to the Fish Research Section where I again was primarily tasked with aquatic insects, this time for acid rain mitigation research. The only difference was that I now worked in close proximity to the endangered species biologist. This provided me the opportunity to work with freshwater mussels as time allowed. Over the years, I had the opportunity to develop the freshwater mussel program for the state. As the Fish Research Section disappeared, I began working with mussels full time.

The state's mussel program has grown from conducting general presence/absence surveys to the establishment of 24 long-term monitoring sites and conducting mussel restoration activities.

As a long standing member of the Ohio River Valley Ecosystem Mollusk Group, I was involved with the development of the original Ohio River Protocol in 2004, which I later used as the basis for development of the WV Mussel Survey Protocol with the assistance of other FMCS members. The WV Protocol has served as an example for other states to develop their own protocols and has

**(Winterringer)**

I was introduced to the malacological conundrum as an undergraduate at Virginia Tech in 1996 when I responded to Dr. Neves' question "Are you willing to work with freshwater mussels?" I said yes, not really fully understanding what freshwater mussels were. Little did I know how that decision would shape my future. What began as a summer job snorkeling in everything from cow-patty-laden headwater streams in southwest Virginia to tropic-esque locations such as the Clinch River was just the beginning of my journey.

Since that first day standing in the stream steeped in cow patty, donned in a mask and snorkel, unionids have been the focal point of each of my career decisions. In my last year at Virginia Tech, I worked as a Biological Technician at the Ohio River Islands National Wildlife Refuge, where I was introduced to large river ecosystems and the impacts of invasive species on our fragile riverine systems. My year at the Refuge confirmed that I was on the right path, and working with unionids and stream ecosystems was my calling.

I went on to pursue a M.S. at Arkansas State and was able to work on the life history of the speckled pocketbook, a federally listed species. My research allowed me to gain valuable experience in unionid propagation, evaluating habitat features of streams and unionid aggregations, identifying associated fish and macroinvertebrate communities, and assessing water and sediment quality along a stream gradient.

I went into environmental consulting to be the bridge -- the voice -- for freshwater organisms. I have spent many hours in rivers and streams from Georgia to Minnesota and east to New Jersey. I feel lucky to have had the opportunity to see such diversity in aquatic ecosystems and in unionids across these different regions. It is during these experiences, academically and professionally, that I have been able to meet and establish relationships with many of those in the Society.

**(Clayton, continued)**

been a great assistance to contractors working within mussel streams. I also teach a week-long mussel identification and ecology class each year, to help researchers, managers, and consultants become familiar with the mussel fauna of WV.

I have been actively involved with FMCS since its inception. I am a member of the Guidelines and Techniques Committee, which I co-chaired for a time. I worked on the development of the AFS Special Publication 30 -- Investigation and Monetary Values of Fish and Freshwater Mussels. I have used this document several times in the course of my work in evaluating mussel kills and I look forward to the opportunity to provide comments as we move forward with revisions of this document. I have attended many Board meetings, both as Committee Co-chair and interested member, and I look forward to expanding my opportunity to serve the Society if elected as your new Secretary.

**(Winterringer, continued)**

I hope to bring a fresh and innovative perspective to the position of Secretary. I have been a member of FMCS since 1997, and I am a member of the Guidelines and Techniques Committee. I was on the committee for the 2010 Workshop in Kirkwood, Missouri, and served on the planning committee for the most recent Workshop in Portland, Maine. I enjoyed my roles in planning and coordinating those workshops. I am high energy, motivated, responsive, organized, and I can offer these same skills in my role as Secretary for FMCS. I understand that a few of the duties of Secretary will be record keeping of Board meetings and Society events; obtain and manage committee reports; and provide notices to the membership, Board, and Committees of meetings and events.

Serving as Secretary would be a great opportunity to build new relationships with members and become more involved in the Society. I will work hard to promote the goals and by-laws of the Society. Membership is a vital component to our success in mollusk advocacy. I will continue to work to increase membership, educate the public about freshwater mollusks, facilitate networking, and connect the public with the Society. I would like to work on making the Society and its mission more accessible to existing and future malacologists, policy makers, and engineers. Greg Zimmerman has done a great job over the years as Secretary and his service is greatly appreciated. I am truly honored by this nomination, as I would be to serve as Secretary for the Freshwater Mollusk Conservation Society.

**Go Vote NOW !**

Now that you have read about these candidates, take a second and **GO VOTE!** To get to the voting form, click on this link : <http://bit.ly/FMCS2014Ballot> . Once there, select the checkbox next to your candidate of choice for each office, then enter your first and last name (used strictly to verify your FMCS membership). Finally, click on the "Submit" button and you will be done. After that, you can go back to reading this issue of *Ellipsaria* with a clear conscience. The voting site will close on January 15, 2015.

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**LAST CALL FOR ABSTRACTS****2015 Joint Meeting of  
The Freshwater Mollusk Conservation Society (FMCS) and  
The Upper Mississippi River Conservation Committee (UMRCC)****St. Charles, Missouri – March 22-26, 2015**

The 9<sup>th</sup> Biennial FMCS Symposium and the 71<sup>st</sup> Annual UMRCC Meeting will be held together on March 22-26, 2015 at the St. Charles Convention Center, St. Charles, Missouri (<http://www.stcharlesconventioncenter.com>). This meeting will feature contributed papers on a range of research and management topics in both oral and poster presentation format, FMCS Committee Meetings and Business Meeting, UMRCC Technical Sessions and Business Meeting, a joint plenary session focusing on the history, successes, and vision of the two societies, and a joint sessions on Big River and Landscape Ecology. The theme for this joint meeting is **Conserving Aquatic Ecosystems – At the Confluence of the Past and Future**. In addition to the customary platform and poster sessions, we will also offer a one-day mussel propagation workshop. The mixers, breaks, auction, and banquets will be jointly held, offering multiple opportunities to network among members. The meeting is hosted by the Missouri Department of Conservation and Ecological Specialists, Inc.

**Location and Travel:**

St. Charles, Missouri, is located on the banks of the Missouri River just a short distance upstream from the confluence with the Mississippi River. St. Charles, the 3<sup>rd</sup> oldest city west of the Mississippi River, was the first Missouri state capital and was the last “civilized stop” on the *Corps of Discovery*. The St. Charles Convention Center is easily accessible by car via Interstate 70 from St. Louis, Missouri. The Convention Center is conveniently located approximately 8 miles from Lambert-St. Louis International Airport (STL); multiple ground-transportation vendors and car rental facilities are available.

**Lodging:**

Discounted lodging is available at the Embassy Suites St. Louis – St. Charles/Hotel & Spa, which is directly adjacent to the convention center. Lodging consists of a two-room suite with separate living and sleeping areas. Hotel rooms will be \$118/night for 1-2 people and \$128/night for 3-4 people (+ tax), and include a complimentary full breakfast and evening reception including adult beverages (Yes, complimentary as in Free...). The Embassy Suites also offers a free shuttle to the St. Charles Historic District.

The discounted room rate for our joint meeting will be available from March 21 to March 27, 2015. Reservations can be made by telephone (636-946-5544) or online at [http://embassysuites.hilton.com/en/es/groups/personalized/S/STLEMES-FMC-20150321/index.jhtml?WT.mc\\_id=POG](http://embassysuites.hilton.com/en/es/groups/personalized/S/STLEMES-FMC-20150321/index.jhtml?WT.mc_id=POG). Make sure to use the Group Name **FMSC/UMRCC** and Group Code **FMC**. *These rates are only good until February 13, 2015*, SO RESERVE YOUR ROOMS NOW!

**Call for Abstracts:**

The abstract submission deadline for the March 2015 joint meeting is **December 15, 2014** (Yes, **THIS December 15...**). The symposium format will be both oral and poster. Oral presentations will be limited to 20 minutes (including the question and answer period). Laptops for the oral presentations will be running Microsoft Windows 7 and PowerPoint 2010. Poster



size is limited to 4' by 4' feet. If you wish to bring a display unit, special arrangements can be made (Contact [Stephen.McMurray@mdc.mo.gov](mailto:Stephen.McMurray@mdc.mo.gov)).

Abstracts for posters and oral presentations are limited to 300 words. The abstract title should appear in all caps and be followed by the author name(s) and affiliation(s). Abstracts should be written in Word utilizing Arial 11 point font. Abstracts should include clearly stated objectives, brief methods, general results, and the basic conclusion. At the bottom of your abstract please indicate your preference of oral or poster presentation and if you are willing to switch formats. Also indicate if this is a senior-authored student presentation that is to be judged for the best student platform/poster award (Note: only 1 senior-authored presentation, be it platform or poster, will be judged; please indicate which presentation you want judged). Submit your abstract to: [Stephen.McMurray@mdc.mo.gov](mailto:Stephen.McMurray@mdc.mo.gov).

**Example abstract from a previous symposium:**

**ASSESSING THE HAZARDS OF CURRENT USE PESTICIDES TO EARLY LIFE STAGES OF**

**NATIVE FRESHWATER MUSSELS.** Robert B. Bringolf<sup>1</sup>, LeRoy F. Humphries<sup>2</sup>, Peter R. Lazaro<sup>1</sup>, Chris Eads<sup>2</sup>, Chris Barnhart<sup>3</sup>, Damian Shea<sup>1</sup>, Jay F. Levine<sup>2</sup>, and W. Gregory Cope<sup>1</sup>.

<sup>1</sup>Department of Environmental and Molecular Toxicology, North Carolina State University, Raleigh, NC 27695; <sup>2</sup>College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606; <sup>3</sup>Department of Biology, Missouri State University, Springfield, MO 65804.

Native freshwater mussels (family Unionidae) are among the most imperiled faunal groups in North America. Approximately 67% of the nearly 300 freshwater mussel species are considered vulnerable to extinction or already extinct. North Carolina has historically supported 56 species of mussels; however, 82% of those species are currently listed as endangered, threatened, or of special concern by the U.S. Fish and Wildlife Service and the State of North Carolina. Although numerous stressors have been implicated in the decline of freshwater mussels, the effects of pesticides on native mussels is largely unknown. Timing of pesticide application combined with the unique life history and reproductive strategy of mussels makes them susceptible to pesticide exposure. The objective of this study was to determine the hazards of pesticides to early life stages of freshwater mussels. We performed acute toxicity tests with glochidia (7 species) and juveniles (6 species) exposed to a suite of current use pesticides (atrazine, fipronil, pendimethalin, and permethrin) and a reference toxicant (NaCl). Our results indicate that these pesticides, at concentrations approaching water solubility, were not acutely toxic to the species of glochidia and juveniles tested. However, in a 21-d chronic toxicity test performed with 4-month old juvenile *Lampsilis siliquoidea* exposed to atrazine, the 14-d atrazine LC50 was 15.8 mg/L (95% confidence interval 12.0-19.5) and the 21-d atrazine LC50 was 4.3 mg/L (95% confidence interval 2.8-5.8). Effects on growth and genotoxicity (single-strand DNA breaks) were also determined in the chronic test. Our results indicate that the relative risk associated with acute exposure of early life stages of mussels to the current use pesticides tested singly is likely low; however, survival and genotoxicity results indicate that chronic exposure of juvenile mussels to atrazine may be impacting mussel populations and warrants further investigation, as does the assessment of pesticide mixtures.

**Preferred Presentation Format:** Oral Platform

**Willing to Switch Format:** Yes/No

**Senior-authored student presentation to be judged for the best student platform/poster award:** Yes/No



The goal of the Program Committee is to assemble and post the draft meeting agenda and abstracts on the FMCS website (<http://molluskconservation.org/>) by mid-January 2015.

### **Meeting Registration:**

Formal registration for the St. Charles meeting is now available on the FMCS website ([http://molluskconservation.org/2015Symposium/2015\\_FMCS-Symposium.html](http://molluskconservation.org/2015Symposium/2015_FMCS-Symposium.html)). NOTE the early registration deadline is **February 13, 2015!** Registration rates include most meals, breaks, and 2-year **membership dues for FMCS** if registering for the full joint meeting or just the FMCS portion as a non-member. Registration is also available for just the UMRCC meeting, including one overlap day with the FMCS Meeting.

## **2015 Joint Meeting Registration Rates**

### ***Early Registration (Through February 13, 2015)***

#### **Full Joint Meeting (Sunday FMCS Mixer – Thursday UMRCC Banquet)**

FMCS Member	\$450
FMCS Student Member	\$360
Non Member (includes 2-year FMCS membership)	\$530
Student Non Member (includes 2-year FMCS membership)	\$400

#### **FMCS Only (Sunday FMCS Mixer – Wednesday Night Auction)**

FMCS Member	\$350
FMCS Student Member	\$260
Non Member (includes 2-year FMCS membership)	\$430
Student Non Member (includes 2-year FMCS membership)	\$300

### ***Late Registration (February 14 - March 13, 2015)***

#### **Full Joint Meeting (Sunday FMCS Mixer – Thursday UMRCC Banquet)**

FMCS Member	\$500
FMCS Student Member	\$400
Non Member (includes 2-year FMCS membership)	\$580
Student Non Member (includes 2-year FMCS membership)	\$440

#### **FMCS Only (Sunday FMCS Mixer – Wednesday Night Auction)**

FMCS Member	\$400
FMCS Student Member	\$300
Non Member (includes 2-year FMCS membership)	\$480
Student Non Member (includes 2-year FMCS membership)	\$340

### **Calling All Students:**

**Student Travel Awards:** To facilitate your participation in the 9<sup>th</sup> Biennial Symposium, student travel awards are being offered by the FMCS. Support is provided via Society-paid lodging accommodations for the duration of the meeting at the host location (Embassy Suites St. Louis – St. Charles/Hotel & Spa). It is anticipated that up to nine awards will be made for the 2015 Symposium. A complete application package must be submitted by e-mail as a PDF file to Dr. Teresa Newton, FMCS Awards Committee on or before **January 15, 2015**. Please see the Awards Committee web site at [http://molluskconservation.org/Mservices\\_awards.html](http://molluskconservation.org/Mservices_awards.html) for application forms and procedures or contact Teresa ([tnewton@usgs.gov](mailto:tnewton@usgs.gov), phone 608-781-6217) for more information.

**Student Volunteers:** The Program Committee is in need of Student Volunteers to help with lights, A/V, and registration during the meeting. In exchange for a few hours' work at the meeting, Student Volunteers will receive a reimbursement on their discounted registration. If you're interested, please contact Daelyn Woolnough ([wooln1d@cmich.edu](mailto:wooln1d@cmich.edu)) or Susan Oetker ([susan\\_oetker@fws.gov](mailto:susan_oetker@fws.gov)) before registering for the meeting.

### **Meeting Theme:**

The theme for this joint meeting is ***Conserving Aquatic Ecosystems – At the Confluence of the Past and Future*** and the joint plenary session will highlight the history of the two organizations and provide outlooks on the future. We are planning on having sessions focusing on Big Rivers and Landscape Ecology and Outreach in Natural Resources. If you have an abstract for the Big River or Landscape Ecology sessions, please contact the symposium committee chair [Stephen.McMurray@mdc.mo.gov](mailto:Stephen.McMurray@mdc.mo.gov). If you have an abstract regarding the Outreach in Natural Resources session, please contact the FMCS Outreach Committee chair [Megan.bradley@dgif.virginia.gov](mailto:Megan.bradley@dgif.virginia.gov).

### **Area Attractions and Planned Trips:**

There are lots of interesting shops, eateries, and bars in historic St. Charles (<http://www.historicstcharles.com>), and the hotel offers free shuttle service to historic Main Street. In addition, several parks and attractions are within an hour's drive of St. Charles, so there will be plenty to do before or after the meeting. Just 25 minutes away is downtown St. Louis, with the Arch, riverfront, and historic Laclede's Landing. At Forest Park, the site of the 1904 World's Fair, discover the world-renowned St. Louis Zoo, Art Museum, Science Center, and Missouri History Museum. Stroll around the world-class Missouri Botanical Garden, visit unique neighborhoods such as Soulard's historic farmer's market, the Central West End's boutiques/antiques, and the funky, fun Delmar Loop.

**Optional Day Trips** are scheduled for Thursday, March 26<sup>th</sup>, 2015. Each trip will include round trip transportation from the Embassy Suites Hotel.

#### **1. Ron Goellner Center for Hellbender Conservation/Saint Louis Zoo**

Part of the Wildcare Institute, the Ron Goellner Center for Hellbender Conservation established a captive breeding and rearing program for hellbenders. In 2011, the Saint Louis Zoo and the Missouri Department of Conservation announced that Ozark hellbenders had been bred in captivity – a world's first for either of the two hellbender subspecies. The decade-long collaboration yielded 165 baby hellbenders. Successful captive-breeding continues to this day. Three fully-functioning man-made Missouri streams exist behind the scenes at the Herpetarium (1 indoor and 2 outdoor) for breeding hellbenders, complete with a rock bed, the occasional afternoon rain shower, and the freshest and purest water in the area, as well as many rearing systems for 4000+ larval and juvenile hellbenders. Here the Zoo has formed a breeding group of adult hellbenders and is head-starting the young hellbenders for eventual release. Following a presentation on hellbender conservation efforts by Dr. Jeff Briggler, MDC Herpetologist, we will be given a behind-the-scenes tour of the facility. After the tour, you will be free to spend the rest of the day visiting the Saint Louis Zoo at your own pace.

This trip includes round-trip transportation to the Saint Louis Zoo. Lunch (on your own) will be available at one of the many reasonably priced dining options in the zoo. Trip Cost will be \$35 per participant (Maximum of 25). More information about the Saint Louis Zoo can be found at: <http://www.stlzoo.org/>. More information about the Ron Goellner Center for Hellbender

Conservation can be found at: <http://www.stlzoo.org/conservation/wildcare-institute/hellbendersinmissouri/>

## 2. Cahokia Mounds State Historic Site

Cahokia Mounds, an Illinois State Historic Site, National Historic Landmark, and one of 22 World Heritage Sites in the US, was the largest prehistoric Indian site in America north of Mexico covering about 6 square miles along the Mississippi River. Cahokia was at its peak around AD 1050-1150, with at least 120 mounds and a population of 10-20,000 people. The culture that built Cahokia was part of the Mississippian tradition that flourished throughout the Mississippi Valley and the south, utilizing this site as a center of trade in this region. Monks Mound is the largest prehistoric earthwork in the Americas (Western Hemisphere), covering over 14 acres and rising in several terraces to a height of 100 feet. Visitors can climb the 156 steps to the summit. A 2-mile long defensive wall around the central 180 acres of the site, including Monks Mound, the Grand Plaza and 17 other mounds was built around AD 1200. Over the next 100 years, this wall of posts was rebuilt three more times. In addition to this wall, "Woodhenge" - a circle monument that was used to track the seasons by alignment of posts on the circle's perimeter with the rising sun on the eastern horizon was built 5 times between AD 1100-1200. The number of posts increased each time of construction (24, 36, 48, 60, 72). The third circle has been reconstructed at the original location and is 410 feet in diameter. There are posts that align with the equinox and solstice sunrises and at other times throughout the year, so it appears to serve as a calendar device, as well as enclosing a sacred space for ritual gatherings. The story of Cahokia is provided in the 33,000 sq. ft. Interpretive Center with an award winning orientation show, numerous exhibits, murals, dioramas, and artifacts, as well as a great gift shop. A lot of mussels were found at Cahokia!

The trip includes round-trip transportation to Cahokia, a box lunch, and a small donation to Cahokia Mounds State Historic Site. The tour will take approximately 4-5 hours, depending on interest and interpretation. Larry Kinsella, a primitive skills expert, has graciously offered to provide primitive skills demonstrations if time allows. Trip Cost will be \$60 per participant. More information about the Cahokia Mounds State Historic Site can be found at: <http://www.cahokiamounds.org/>. More information about Larry Kinsella can be found at: <http://flintknapper.com/>

## 3. National Great Rivers Museum & the Melvin Price Locks & Dam/National Great Rivers Research and Education Center

This trip will begin with a brief stop at the Missouri Department of Conservation's Columbia Bottoms Conservation Area, where attendees will have the opportunity to view the confluence of the Missouri and Mississippi Rivers from an observatory near the actual confluence.

The tour will then resume, crossing the Mississippi River to Illinois, where we'll visit the National Great Rivers Research and Education Center for an 11:00 tour (~60 minutes). Founded in 2002 as a collaborative partnership between the University of Illinois at Urbana-Champaign, the Illinois Natural History Survey, and Lewis and Clark Community College, the National Great Rivers Research and Education Center is dedicated to the study of great river systems and the communities that use them. The center aspires to be a leader in scholarly research, education, and outreach related to the interconnectedness of large rivers, their floodplains, watersheds, and their associated communities.

After lunch, we'll have the opportunity to visit the National Great Rivers Museum (~30 minute self-guided tour) at the Melvin Price Locks and Dam prior to our scheduled 2:00 Locks and Dam tour (~90 minutes). This Museum is dedicated to telling the story of the Mississippi River...

from her grand history and cultural significance, to her ecological importance and role as a transportation corridor. Melvin Price Locks and Dam replaced Lock and Dam 26, which was demolished in 1990. Almost from the beginning, Lock and Dam 26 was plagued with structural deficiencies. Scour holes developed below the dam. This was of particular concern because some of the holes were deeper than the wooden pilings supporting the dam. The scouring of the riverbed led to the disintegration of the concrete and a loss of foundation material, which eventually resulted in excessive deflections and settlement of the lock walls and dam piers. The construction of the Melvin Price Locks and Dam constituted the first replacement of an original installation of the 9-Foot Channel Project.

The trip includes round trip transportation, a box lunch, and a small donation to the National Great Rivers Museum. Trip Cost will be \$60 per participant (Maximum of 25). More information about Columbia Bottoms Conservation Area can be found at: [http://extra.mdc.mo.gov/documents/area\\_brochures/9736.pdf](http://extra.mdc.mo.gov/documents/area_brochures/9736.pdf). More information about the National Great Rivers Research and Education Center can be found at: <http://www.ngrrec.org/>. More information about the Melvin Price Locks and Dam can be found at: <http://www.mvs.usace.army.mil/Missions/Recreation/RiversProjectOffice/NGRM.aspx> and <http://www.mvs.usace.army.mil/Missions/Navigation/LocksandDams/MelvinPrice.aspx>

**Auction Items Needed!**

Don't forget to bring your items for the auction! We will have our annual auction at the March, 2015 FMCS symposium and joint meeting with the UMRCC. Money generated during the FMCS auctions help fund travel and scholarships for students attending our symposia. Please consider bringing the following items for auction: books, scientific journals, antiques, carvings, pictures, paintings, pottery, jewelry, hunting, fishing, boating, and camping equipment. Quality oddball-quirky "river booty" also would be great! Please bring items to the symposium where there will be a designated area for storage. If you have questions please contact Steve Ahlstedt ([bigshelldaddy@bellsouth.net](mailto:bigshelldaddy@bellsouth.net), 865.776.9510) or Lisie Kitchel ([Lisie.Kitchel@Wisconsin.gov](mailto:Lisie.Kitchel@Wisconsin.gov)). If you need to ship large items, contact Steve McMurray ([Stephen.McMurray@mdc.mo.gov](mailto:Stephen.McMurray@mdc.mo.gov)) or Heidi Dunn ([hdunn@ecologicalspecialists.com](mailto:hdunn@ecologicalspecialists.com)).

**Sponsorships:**

We are still seeking sponsorships for the Joint Meeting. All sponsor contributions include recognition in the joint meeting program.

<b>Sponsorship Levels</b>		
<b>River</b>	>\$1000	One Complimentary Registration, Logo on Website Registration Page
<b>Stream</b>	\$500-\$1000	One Registration Reduced by 25%, Logo Displayed at the Welcome Mixer, Logo on Website Registration Page
<b>Eddy</b>	\$100-\$499	Logo on Website Registration Page
<b>Mussel</b>	<\$100	Recognition in the Workshop Program

To become a sponsor for this Joint Meeting, please go to: [http://www.molluskconservation.org/2015Symposium/2015SYMP\\_SPONSOR.html](http://www.molluskconservation.org/2015Symposium/2015SYMP_SPONSOR.html) or contact Heidi Dunn ([hdunn@ecologicalspecialists.com](mailto:hdunn@ecologicalspecialists.com)).



**FMCS-UMRCC JOINT MEETING PROPOSED SCHEDULE – ST. CHARLES, MISSOURI  
MARCH 22-26, 2015**

***Conserving Aquatic Ecosystems – At the Confluence of the Past and Future***

Sunday 3.22.2015	Monday 3.23.2015	Tuesday 3.24.2015	Wednesday 3.25.2015	Thursday 3.26.2015	
			UMRCC Executive Board Meeting 6:30-8:15 am Trelor Room (Embassy Suites)		
Mussel Propagation Workshop 8:00 am-5:00 pm (Box Lunch Provided) Meeting Room 105	Concurrent Paper Sessions 8:00-10:00 am 10:20-12:00 pm Grand Ballroom A & B	Concurrent Paper Sessions 8:00-10:00 am 10:20-12:00 pm Grand Ballroom A & B	Joint Plenary Session 8:30-10:00 am Grand Ballroom A/B	Optional Field Trips 8:00-5:00 pm (Box Lunch Provided)	Mussel Technical Section 8:00-10:15 am
	Box Lunch (FMCS Comm. Mtgs.) 12:00-1:40 pm Grand Ballroom C/D	Box Lunch (FMCS Comm. Mtgs.) 12:00-1:40 pm Grand Ballroom C/D	Big River Ecology/Landscape Ecology Session(s) 10:20-12:00 pm Grand Ballroom A/B		Fisheries, Law Enforcement, Water Quality, OREIT 10:30 - 12:00
	Concurrent Paper Sessions 1:40-3:20 pm 3:40-5:00 pm Grand Ballroom A & B	Concurrent Paper Sessions 1:40-3:20 pm 3:40-5:00 pm Grand Ballroom A & B	Concurrent Paper Sessions 1:40-3:20 pm 3:40-5:00 pm Grand Ballroom A & B		UMRCC Tech Sections Cont'd 1:00-3:30
					UMRCC Business Meeting 3:45-5:30 pm
Dinner (On Your Own) 5:00-7:00 pm FMCS Executive Board Meeting 5:00-7:00 pm PFP Boardroom	Dinner (On Your Own) 5:00-7:00 pm	FMCS Banquet, Business Mtg., Awards Presentations 6:00-8:00 pm Grand Ballroom C/D	Dinner (On Your Own) 5:00-7:00 pm	UMRCC Banquet, Awards Presentations 6:00-8:00 pm Grand Ballroom C	
Welcome Reception 7:00-11:00 pm Grand Ballroom C/D	Mixer/Poster Session 7:00-11:00 pm Grand Ballroom C/D	Mixer (The Diva and The Dude) 8:00-11:00 pm Grand Ballroom C/D	Mixer/Joint Auction 7:00-11:00 pm Grand Ballroom C/D	Mixer 8:00-11:00 pm Grand Ballroom C	

**ONE LAST THING ! - Send Us Your Photos!!:**

New for this Symposium, we would like to run a PowerPoint presentation during the mixers, etc., showing FMCS and UMRCC members doing their thing. So, send your field photos, lab photos, etc., to show off your work or having fun! Send photos to Heidi Dunn ([hdunn@ecologicalspecialists.com](mailto:hdunn@ecologicalspecialists.com))

**We really look forward to seeing you in St. Charles in March 2015!!**

## Last Call for 2015 FMCS Professional Award Nominations

Do you know someone who has made worthwhile contributions to mussel conservation or to the Society, either through donating their professional time or expertise or through their scientific endeavors? Consider nominating them for one of the three FMCS Professional Awards.

- **The Meritorious Service Award** — given to an individual for singular accomplishments or long-term contributions to the Society. The recipient of this award must be a past or present FMCS member who has performed long-term, exceptionally high-quality service to the Society.
- **The William J. Clench Memorial Award** — given to an individual for singular accomplishments or long-term contributions that have advanced the natural history and understanding of freshwater mollusks at an academic or non-academic level. The recipient of this award must have had (1) activity in one or more aspects of freshwater mollusks for a substantial period of time (with a recommended minimum guideline of 20 years), and (2) made substantial contributions to the field of freshwater malacology.
- **The Lifetime Achievement Award** — given to an individual for singular accomplishments or long-term contributions that have advanced the conservation and science of freshwater mollusks at a national or international level. The recipient of this award must have had (1) activity in one or more aspects of freshwater mollusk research and/or conservation for a substantial period of time (with a recommended minimum guideline of 20 years), and (2) made substantial contributions to the scientific understanding of freshwater mollusks and/or their conservation.

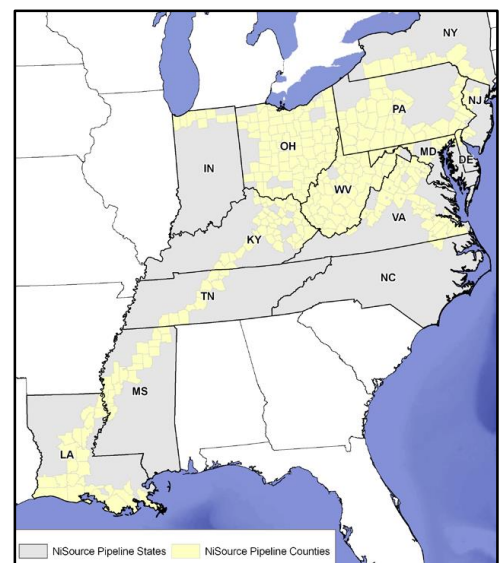
For procedures associated with nominating someone for one of these awards, see the Awards Committee web site: [http://molluskconservation.org/Mservices\\_awards.html](http://molluskconservation.org/Mservices_awards.html) To be considered this year, all nominations and the supporting documentation packages must be submitted by **January 16, 2015**. For more information, contact Greg Cope, [greg\\_cope@ncsu.edu](mailto:greg_cope@ncsu.edu) , 919-515-5296 or Teresa Newton, [tnewton@usgs.gov](mailto:tnewton@usgs.gov) , 608-781-6217.

## FMCS is Represented on the NiSource Mitigation Panel

Our society has agreed to participate on an endangered species Mitigation Panel being established by NiSource Inc., the parent company of several affiliates involved in the transmission and distribution of natural gas and electricity. Our representative, John Jenkinson, recently attended the introductory meeting of this Mitigation Panel in Charleston, West Virginia.

NiSource's natural gas transmission affiliate – Columbia Pipeline Group (CPG) – operates a roughly 15,000 mile interstate pipeline network ranging from Louisiana to New York. CPG's pipeline and facility easements cross approximately 6.4 million acres of land in this 14-state service territory (see map).

About 10 years ago, NiSource approached the U.S. Fish and Wildlife Service (FWS) regarding the development of a Habitat Conservation Plan (HCP) for the CPG system, with the goal of streamlining the many Endangered Species Act



consultations they were conducting concerning routine maintenance activities and plans for new projects. After reviewing considerable input from the Federal Energy Regulatory Commission, the U.S. Army Corps of Engineers, resource agencies within the affected States, and a public review, the FWS completed an Environmental Impact Statement and, ultimately, issued the final NiSource HCP and an associated Incidental Take Permit (ICP) in September 2013.

Probably stated too simplistically, the HCP allows NiSource to conduct activities along the CPG pipeline system using approved avoidance and minimization measures to address potential impacts to listed species. Under the ITP, when projects could result in adverse impacts to ten identified endangered or threatened species (five of which are freshwater mussels: clubshell, fanshell, James spiny mussel, Northern riffleshell, and sheepsnose), NiSource would be required to mitigate for those impacts. NiSource and CPG have committed to fund off-site, landscape-level mitigation projects that would benefit the affected species in amounts that fully compensate for the anticipated adverse effects. The HCP became effective January 1, 2014, and is intended to remain in force for 50 years.

When terms of the HCP require a need for off-site mitigation affecting one or more of the ten listed species, NiSource will solicit proposals and conduct an initial pertinence screening, then the proposals will be reviewed by the Mitigation Panel. A total of six non-governmental organizations (NGOs) have agreed to participate as the core of this panel: Bat Conservation International, Environmental Defense Fund, National Wild Turkey Federation, The Nature Conservancy, Trout Unlimited, and FMCS. NiSource and the FWS purposely included NGOs with broad interests and expertise in recognizing opportunities to benefit the listed species and associated habitats. The broad range of interests represented on the panel also will encourage the recognition of benefits to non-protected species and the people who appreciate them. All of the Panel's comments and recommendations about the proposals they review will be provided to NiSource and FWS. NiSource will review the Panel's input, make specific recommendations to FWS, and FWS will decide which projects will be funded. Details of the solicitation and review process have not yet been determined, but are forthcoming.

The stated goal of this landscape-level mitigation concept is to aggregate benefits to species in a few larger projects at important protection or recovery sites instead of funding smaller or marginally effective projects closer to the impact sites. During the development of the HCP, FWS decided that research projects would not be a priority for consideration as mitigation under this HCP. Even during the initial meeting of this Panel, it was obvious that FMCS will be expected to provide an important perspective on the types of larger mitigation projects that could benefit protected aquatic species.

The most approachable introduction to all of the documents available online about NiSource, the HCP, and the Mitigation Panel may be the FWS Questions and Answers post about the Record of Decision and their Environmental Impact Statement. That document is available at: <http://www.fws.gov/Midwest/endangered/permits/hcp/nisource/NiSourceNOARecOfDecFAQsNov2013.html> . If you have questions about this developing Mitigation Panel or our Society's involvement, please contact John Jenkinson at [jjjenkinson@hotmail.com](mailto:jjjenkinson@hotmail.com) .

## Regional Meetings

### FMCS Regional Mollusk Meeting Assistance Award Program

As described in the December 2012 issue of *Ellipsaria*, the FMCS has established a Regional Mollusk Meeting Assistance Award Program to facilitate regional mollusk meetings that address local and regional concerns with freshwater mollusk conservation and management. Our interest in assisting with these

meetings is to bring people together who work with freshwater mollusks to exchange information on how to conserve and protect this faunal group. These meetings are often attended by a variety of individuals, including agency personnel, academia, private citizens, scientists, and others, some of whom may not be FMCS members. Therefore, a secondary goal of this program is to increase the awareness of, and membership in, FMCS among individuals in these groups. Support is provided via a cash award of \$100 to the regional group to help defray the costs (e.g., meeting room rental, speaker travel, break refreshments, etc.) associated with holding their meeting. It is anticipated that about 15-20 awards will be made in a given calendar year.

The complete program description and application form may be obtained from the Awards Committee website at [http://www.molluskconservation.org/Mservices\\_awards.html](http://www.molluskconservation.org/Mservices_awards.html). One copy of the completed application must be received by the Chair of the Awards Committee at least two months prior to the Regional Mollusk Meeting to allow for application and payment processing.

## The Eighth Annual Ohio (River) Valley Unified Malacologists Meeting [OVUM]

Charles F. Sturm, Timothy A. Pearce, and Yurena Yanes

The 8<sup>th</sup> annual meeting of OVUM was held on 27 September 2014, at the University of Cincinnati, Cincinnati, Ohio. The meeting was convened by Dr. Yurena Yanes. There were 15 people in attendance including professionals, students, and amateurs. The eight presentations covered gastropods, bivalves, polyplacophorans, modern and fossil mollusks from marine, freshwater and terrestrial realms, as well as shell collection management.



Participants at the 2014 Ohio (River) Valley Unified Malacologists Meeting. Back row (left to right): Avonelle Combs, Wesley Parker, Tom Watters, Tim Pearce. Front row: Francisco Borrero, Ieva Roznere, Kyle Hartshorn, Yurena Yanes, Katherine Bulinski, Alex Wall. Not shown: Charlie Sturm (photographer), Lori Schroeder, Jeff Schroeder, and two others.

**Stable Isotope Ecology of Land Snails from Fairbanks, Alaska.** Yurena Yanes, Department of Geology, University of Cincinnati, Cincinnati, OH. [yurana.yanes@uc.edu](mailto:yurana.yanes@uc.edu)

High-latitude land snails from boreal forests record the signature of the vegetation and the precipitation in their carbon and oxygen stable isotope values. Fossil land snails from Alaska will provide credible paleoenvironmental information of the recent past.



**The Annulariidae of Central America.** **G. Thomas Watters**, Museum of Biodiversity, Ohio State University, Columbus, OH. [watters.1@osu.edu](mailto:watters.1@osu.edu)

The Central American Annulariidae were discussed. Eighteen species are recognized. Central America may be the ancestral source of other Annulariidae.

**Recovering an Endangered Mussel: the Northern Riffleshell.** **G. Thomas Watters**, Museum of biodiversity, Ohio State University, Columbus, OH. [watters.1@osu.edu](mailto:watters.1@osu.edu)

Over 7 years, approximately 10,000 Northern Riffleshells (*Epioblasma torulosa rangiana*) have been translocated from Pennsylvania to Ohio as part of the recovery of this federally endangered species. All are fitted with passive integrated transponders. The challenges of arranging the translocations and follow up monitoring were discussed.

**Land Snails on San Clemente Island, CA: Status Report on New Finds.** **Timothy A. Pearce\***, Charles A. Drost, Jeffrey C. Nekola, Brian F. Coles, and Neil S. Cobb, \*Section of Mollusks, Carnegie Museum of Natural History, Pittsburgh, PA. [pearcet@carnegiemnh.org](mailto:pearcet@carnegiemnh.org)

To fulfill the U.S. Navy's natural resources management plan for land snails, we surveyed on San Clemente Island from the different habitat types. Of 14 modern species, 5 taxa are endemic to the island. We documented 3 new species records for the island and one species new to science. Most species are widespread, but some occurred in uncommon habitats.

**Management of Mollusk Collections - Dealing with Byne's and Glass Decay.** **Francisco J. Borrero** and Paul Callomon, Department of Malacology, Academy of Natural Sciences at Drexel University, Philadelphia, PA. [borreroofcoj@gmail.com](mailto:borreroofcoj@gmail.com)

Seven conditions found within collections can negatively affect the long term quality of specimens. Byne's and glass decay are two consequences of improper storage, which include non-archival quality materials and improper environmental (temperature, pH) conditions and their fluctuations. Byne's decay results in permanent damage. Effects of Byne's decay can be stopped or slowed down, but not reversed. Care of type specimens (name-bearing specimens) is particularly important, and preventing damage by employing appropriate conditions should be a priority.

**Keying and Identifying the Bowling Green State University Shell Collection.** **Avonelle Combs**, Bowling Green State University, Bowling Green, OH. [combsar@bgsu.edu](mailto:combsar@bgsu.edu)

With 15,000 specimens in Bowling Green State University's possession, inventorying what species are among these numbers is key in both educating the public and helping the scientific community. The challenges of managing this collection was discussed.

**The Oldest Known Multiplacophoran?** **Kyle Hartshorn**, Dry Dredgers, Cincinnati, OH. [khartshorn1.0@gmail.com](mailto:khartshorn1.0@gmail.com)

I reviewed *Eobalanus* Ruedemann from the Upper Ordovician Indian Castle Shale of New York state. This problematicum was initially misidentified as a barnacle, but reinvestigation indicates it may actually be the oldest known multiplacophoran (Polyplacophora: Multiplacophora), extending the range of these Paleozoic chitons by ~25 million years. The type specimens are preserved in association with nautiloid cephalopod conches, perhaps giving a hint at their paleoecology.

**Marginal Damage, Major Consequences: Effects of Sub-Lethal Shell Damage in *Mercenaria*.** **Alex F. Wall**, Department of Geology, University of Cincinnati, Cincinnati, OH. [wallaf@mail.uc.edu](mailto:wallaf@mail.uc.edu)

Non-lethal shell damage has been implicated as a barrier to the ability of bivalves to evolve robust shell armor. An experiment was conducted mimicking a fake busyconine whelk attack, breaching the margin of *Mercenaria* clams.

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## 2015 Chesapeake Bay Freshwater Mussel Workgroup Meeting

We will be holding the 6<sup>th</sup> meeting of the Chesapeake Bay Freshwater Mussel Workgroup at the U.S. Fish & Wildlife Service office, in Annapolis, Maryland. Traditionally, the meeting is held during the later half of the second full week in January, but is dependent upon the availability of the web conferencing equipment and could be as late as the first or second week of February. The need for a second, short day will be determined based upon the number of presenters, particularly those traveling. The meeting is open to anyone, but primarily attended by resource agency biologists, consultants, and others interested

in and working on freshwater mussels in rivers and streams of the Bay. Teleconferencing and webcast capabilities will be available for those interested in participating, but cannot travel. Light refreshments and pastries are provided in the morning. We particularly encourage any students that might be interested to attend. Past presentations and topics of discussion include ecosystem services of mussels, basin-wide inventories, mussel propagation, state updates on the status of listed species, FERC relicensing, plus much more.

For more information, contact Julie Devers at [julie.devers@fws.gov](mailto:julie.devers@fws.gov) or Matt Ashton at [matthew.ashton@maryland.gov](mailto:matthew.ashton@maryland.gov). Further details will be forthcoming via email including a call for presentations and request to those in need of conference capabilities. Information is primarily sent through a distribution list of past and interested attendees, but will also be sent via the Unio list-serve.

## Upcoming Meetings

**January 21-22, 2015** -- Annual Alabama Mollusk & Crayfish Meeting, Five-Rivers Delta Resource Center, Spanish Fort, Alabama Contacts: Jeff Garner ([bleufer@aol.com](mailto:bleufer@aol.com)) or Paul Johnson ([paul.johnson@dcnr.alabama.gov](mailto:paul.johnson@dcnr.alabama.gov))

**March 22 -- 26, 2015** -- National Shellfisheries Association 107th Annual Meeting, Monterey, California, Theme: [yet to be announced] <http://www.shellfish.org/annual-meeting> .

**March 22 -- 27, 2015** – FMCS Symposium/Joint meeting with the Upper Mississippi River Conservation Committee, St. Charles, Missouri. Theme: “*Conserving Aquatic Ecosystems – At the Confluence of the Past and Future.*” <http://molluskconservation.org/Events.html>

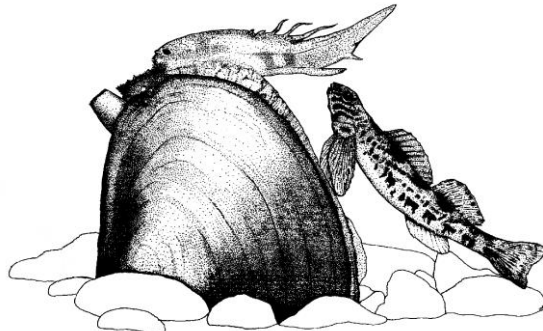
**May 17 – 21, 2015** -- Society for Freshwater Science Annual Meeting, Wisconsin Center, Milwaukee, Wisconsin. Theme: “*Our Freshwater Futures.*” <http://sfsannualmeeting.org>

**August 2 -- 6, 2015** -- International Congress for Conservation Biology, Montpellier, France <http://www.conbio.org/conferences/about-scb-meetings/past-iccbs>

**August 28 – 31, 2015** -- American Malacological Society 81<sup>st</sup> Annual Meeting, University of Michigan Biological Station, Pellston, Michigan <http://www.malacological.org/meetings/2015/AMS%202015%20Michigan%20ad.pdf>

**October 4 -- 8, 2015** -- Second International Meeting on Biology and Conservation of Freshwater Bivalves, Buffalo, New York, USA <http://greatlakescenter.buffalostate.edu/>

**March, 2016** – FMCS Genetics Workshop, National Conservation Training Center Shephardstown, West Virginia.



## Contributed Articles

The following articles have been contributed by FMCS members and others interested in freshwater mollusks. These contributions are incorporated into Ellipsaria without peer review and with minimal editing. The opinions expressed are those of the authors.

### **Investigation into the Demise of the Freshwater Mussel Fauna of Marsh Creek, McCreary County, Kentucky: an Interagency Approach**

**Sue Bruenderman**, Kentucky Division of Water

The Cumberland elktoe (*Alasmodonta atropurpurea*) once thrived in Marsh Creek, a small mountain stream in McCreary County, Kentucky, above Cumberland Falls. This thin-shelled bivalve species, which grows to about 3.5 inches in length and just over an inch in height, was never very common. It can be found only in the upper Cumberland River System in southeast Kentucky and north-central Tennessee. Its population size and distribution was naturally limited by the 85-foot height of Cumberland Falls, as well as by harsh environmental conditions characteristic of streams above the falls. Despite these unfavorable conditions, the Cumberland elktoe adapted to the calcium-and-food-limited waters of Marsh Creek, burrowing into small pockets of sand and mud amidst Cambrian-aged sandstone rocks and boulders.



An approximately 18 yr old Cumberland elktoe from Marsh Creek found on June 6, 2012. This individual was emaciated, gaping, and died the day after transport to KDFWR’s Mollusk Conservation Center. Collected and photographed by Jacob Culp, KDOW.

Today, the Cumberland elktoe is listed as Endangered by the U.S. Fish and Wildlife Service (USFWS). It has all but disappeared from Marsh Creek, along with six other mussel species that once lived there. Asian clams exist throughout the basin, but they are not very healthy, as exhibited by relatively low numbers and excessive shell erosion, even in young specimens.



Marsh Creek once supported the most diverse freshwater mussel fauna in the Cumberland River above Cumberland Falls. Photo by Sue Bruenderman, KDOW



A Marsh Creek tributary on a “reclaimed” strip mine with specific conductance value of 1119 us/cm<sup>-1</sup>. The Cumberland elktoe thrives in waters with specific conductance less than 50 us/cm<sup>-1</sup>. Photo by Sue Bruenderman, KDOW

In response to the catastrophic decline of the Marsh Creek mussel fauna, concerned biologists representing Kentucky State Nature Preserves Commission (KSNPC), Kentucky Division of Water (KDOW),



USFWS, U.S. Forest Service (USFS) and Kentucky Department of Fish and Wildlife Resources (KDFWR) met in December, 2011 and formed the Marsh Creek Basin Work Group. The group developed a study plan to answer these questions: 1) is the absence of mussels the result of an acute incident which caused a massive mussel kill? Or did one or more chronic problems accumulate slowly, killing the mussels over time?, 2) if we reintroduce mussels into Marsh Creek, can they survive and grow? And finally, 3) if we can successfully identify causes contributing to the mussel decline, is remediation and reestablishment of the mussel fauna possible?

We are concluding the third year of our study. During 2012 and 2013, we sampled fish, macroinvertebrates (including mussels), surface water, stream sediment, and assessed habitat in Marsh Creek and many of its tributaries. The collected information enabled us to measure the overall ecological integrity of Marsh Creek.

All information collected to date indicates that acid mine drainage has harmed populations of mussels, bugs and fish in the upper reaches of Marsh Creek. The waters of Marsh Creek are naturally, acidic and the endemic mussel species adapted over time to these poorly buffered waters. Extensive surface coal mining occurred through the 1980s in the headwaters and was a considerable land disturbance in the narrow valley of Marsh Creek. Many coal mines were abandoned or poorly reclaimed in headwater reaches, releasing minerals and heavy metals into the water and increasing its total acidity.

We were aware of other problems in Marsh Creek before the study began. We knew from survey work conducted by the KSNPC in the late 1980s that there was an unreported oil spill that killed at least 500 Cumberland elktoe and other mussels in Marsh Creek near the Kidd School Road crossing in the middle portion of the watershed. Creek sediment analyzed in 2013 showed that high levels of oil and grease remain in the river sediment at this and other locations downstream of this site. Another known, continual and significant problem is excessive erosion and siltation from the mines and urban development in upper Marsh Creek. Organic enrichment from sewage and excessive nutrient input also degraded water quality.

The good news is that many small tributary streams feeding directly into Marsh Creek still have excellent water quality, even in the most polluted uppermost reaches. Our hope is to identify one or even a few places that can serve as mussel refuges, which may buy us some time while we work to identify the most significant causes and sources contributing to the mussel decline.

On July 29, 2013, to test for survival and growth, KDFWR placed artificially-raised juvenile *Lampsilis cardium*, contained in concrete mussel silos, at nine KDOW study sites in Marsh Creek, Indian Creek (a reference site), and several larger tributaries feeding Marsh Creek. We retrieved these at the end of May 2014. Unfortunately, all silos at the historic oil spill location were vandalized, but surprisingly, many animals at the other stations were still alive after nine months despite the silos being packed with sediment and mud.



Juvenile *Lampsilis fasciola* (left), raised by Dr. Monte McGregor and his staff at KDFWR's Mollusk Conservation Center, ready for placement into silos (right). Photos by Pam Martin, USFS.

*Lampsilis cardium* juveniles recovered from silos after a 9-month deployment in Marsh Creek. Photo by Eugenia Jones, *McCreary County Voice*.



That same day in May, 2014, we deployed a second set of larger and older (to help ensure we had enough tissue for contaminant analysis) *Lampsilis fasciola*, along with additional pocketbooks. These silos were retrieved in late September, 2014. Vandalism again was a problem (all reference site silos were missing); as was beaver activity (they built dams on top of the silos at two sites). More interesting, perhaps, was that we recovered very few live animals from any sites this time around. The reason for differences in survival between the two years is still unclear. The juveniles we were able to recover from both May and September 2014 were sacrificed at the end of the survival experiments, their tissues frozen, and will be processed and analyzed for contaminants during 2015 by KDOW and the Kentucky Division of Environmental Services Branch in Frankfort.

## A Tale of Tinkers Creek and the Unlikely Return of Freshwater Mussels

**Allyson R. Craig** and **Robert A. Krebs**, Department of Biological, Geological and Environmental Sciences, Cleveland State University, Cleveland, Ohio 44115, USA.  
[a.r.craig@vikes.csuohio.edu](mailto:a.r.craig@vikes.csuohio.edu), [r.krebs@csuohio.edu](mailto:r.krebs@csuohio.edu)

Ask any resident of Twinsburg, Ohio, what's in Creekside Plaza and they will excitedly ramble on about Chipotle, Gander Mountain, and Brewsters. Ask what is in the actual nearby creek, and their response will probably be a strange expression and a confused mumble of "nothing?" Fifteen years ago they would have been correct.

Our tale of Tinkers Creek begins with a developer named Bill Whitlatch, who dreamed of building a large shopping complex in downtown Twinsburg. The creek, however, flowed past an intended mall parking lot, restricting the number of spaces required for any large development. That just wouldn't do. In 1995, Whitlatch filed an application with the U.S. Army Corps of Engineers for permission to relocate 1,154 feet of the creek and fill in 2.20 acres of adjacent wetlands. The Corps of Engineers decided that the alteration of Tinkers Creek and surrounding wetlands would "not result in any unacceptable environmental impacts," and issued the permit in January 1998. Unfortunately for freshwater mussels, the term "unacceptable impacts" depends on point of view.

In the summer of 2000, shortly after Whitlatch's project was complete, the effects of the relocation on mussel diversity in Tinkers Creek was investigated (Krebs et al. 2002). Bill Whitlatch even took the time to escort one of us (RAK) around the property, where he showed off his rebuilt wetlands with 1 m high trees wrapped in chicken wire to ward off deer. He proudly reported that his team had picked up every mussel they found and moved them down stream. Although 138 live mussels, representing five species, were found during the survey, not a single specimen or even a shell occurred within the altered channel. Numerous unionids were found both above and below the site, but none had settled in the two-meter deep, clay-bottomed trench behind Creekside Plaza. It really seemed as if there was "nothing" in the creek but clay and water.

In July 2014, we decided to reevaluate the status of Unionidae in Tinker's Creek, but with scant optimism, as nothing had been found in 2000 or in a short follow-up in 2004. As we descended into the creek, we could still see old tarps clinging to the sides of the manmade channel. Once we stood on the shallow rocky substrate extending from a drainage channel running from under the shopping complex, however, two mussel valves lay in the stream bed: one of a Giant Floater (*Pyganodon grandis*) and the other of a Wabash Pigtoe (*Fusconaia flava*). They offered hope.



Figure 1: The Tinker's Creek channel relocation necessary to make way for construction of Creekside Plaza, Twinsburg, Ohio.



Figure 2. Tinker's Creek in 2001 (left), two years after relocation, and 15 years later (September, 2014, right), although the images do not align precisely. Originally, the relocated path of the creek flowed across the land visible as a raised parking lot to the right of the trees in the older picture.

Excited at the possibility of mussels once again populating the area, we continued to survey upstream through the now tree-lined channel. Feeling with hands and feet, and wielding a mussel rake where the substrate was soft, we turned up additional shells and, eventually, live specimens. Nothing had become something. We eventually found all but one of the eight species known to occur in the stream before it was disturbed. The clay sediment had been covered over with sand, mud, and gravel, conditions much more favorable for mussels. Wabash Pigtoe was most abundant among the 27 live specimens we found, but we also recorded Giant Floater, Fatmucket (*Lampsilis siliquoidea*), Creek Heelsplitter (*Lasmigona compressa*), Fluted shell (*Lasmigona costata*), Creeper (*Strophitus undulatus*) and Lilliput (*Toxolasma parvum*). Most of these mussels were young, no more than five years old. The Creek Heelsplitter was less than one year old, only the size of a thumbnail. Only a few hundred meters downstream, mussels appeared even more abundant, and the last species was also found, an Elktoe (*Alasmidonta marginata*). However unlikely, Bill Whitlatch's modification of the creek channel had recovered from the environmental impact.

Despite the severe habitat disruption in 1998, Tinker's Creek now teems with minnows, crayfish, and freshwater mussels. The once man-made site has taken on a more natural, sinusoidal shape as well. No additional remediation occurred, although Summit County Metro Parks has been active protecting the upstream headwaters.

What we learned is that, given time and with no further impacts, nature can reclaim a stream. Although he has since passed away, Bill Whitlatch probably would have been glad to know his development of Creekside Plaza did not permanently harm Tinker's Creek. He claimed back then that, for what he had to pay in remediation costs, he wanted that project done right. No money had been set aside for monitoring, so no one watched nature return to those 1,154 feet of creek to a more natural condition. As long as no one else decides to expand into the creek, its future looks bright.

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## Aligning Ideal Host and Habitat Requirements Help Locate a Vast Population of Hickorynuts in the Ottawa River

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The Canadian distribution of the Hickorynut mussel, *Obovaria olivaria*, has declined over much of its historical range, and is now limited to only six rivers in the provinces of Ontario and Québec. Recently, the Hickorynut has been listed as 'Endangered' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2013). Our unionid surveys point to the Ottawa River as a prime location for viewing populations of Hickorynut mussels. In a single dive, SCUBA divers can observe many Hickorynut mussels filter-feeding in ideal conditions with visibility up to 2 meters.

One stressor is the decline of the Lake Sturgeon, believed to be the key host fish for the Hickorynut in Canadian waters. During the past centuries, Lake Sturgeon stocks have declined drastically over much of the Eastern Canadian region, including the Laurentian Great Lakes, the St. Lawrence River and its primary Canadian tributary, the Ottawa River. The decline of this long-lived fish is attributed to overfishing, water pollution, and the construction of large dams (Haxton & Findlay 2008). Dams block the natural movements of fish and eliminate or degrade large rapids, the Sturgeon's favored spawning grounds. Since the early 1990's, the invasion of Zebra Mussels has also been linked to the decline of the Hickorynut in the Laurentian Great Lakes and St. Lawrence River: however, there is no evidence of zebra mussels impacting on unionid mussels of the Ottawa River yet.

We knew from the literature (Baker 1928, Parmelee & Bogan 1998), as well as from our 2013 field data on the distribution and abundance of Hickorynut populations in the Ottawa River, that this mussel favors mid- to large rivers, deep water (over 3 m in depth), sandy bottoms, sites far from shore, and strong currents. This year, in addition to accounting for the species' habitat preferences, we decided to search in areas where its probable host fish, the Lake Sturgeon, is most abundant.

To identify the best sturgeon habitat in the Ottawa River, we consulted Tim Haxton's doctoral thesis (2007), well as Haxton & Findlay's 2008 publication on the Lake Sturgeon's distribution in the Ottawa River. Then, this host fish information was linked to Hickorynut habitat preferences. The Finlay Islands area, in the reach called Lac Coulonge, just upstream from Fort-Coulonge, Québec, matched all the criteria for Hickorynuts: a long reach where the river is wide (500 m to over 1000 m wide), average depth of 3 to 6 m across nearly the entire width of the river, strong current, and no dam nearby. The bottom is sandy and, above all, Lake Sturgeons are abundant in the area. The Finlay Islands are also an ecological reserve.

This strategy for determining diving sites paid off well beyond our expectations! Right on the first dive, we hit the jackpot! In the middle of a wide stretch of the river at a depth of about 4 meters and in a strong current (5-10+ cm/sec), we discovered a vast population of Hickorynuts! The average density of this population was approximately 0.84 individuals per square meter (1 m x 1 m quadrat); high for a rare species. Our data showed that in the area south of the Finlay Islands, Hickorynuts often made up over 25% of all mussels in our quadrats. Moreover, we were able to determine that this particular Hickorynut population is widely distributed, apparently covering the equivalent of many square kilometers of sandy bottom habitat. We estimate that there are tens if not hundreds of thousands of Hickorynuts in this area alone!



Figure 1. The portion of the Ottawa River where a vast Hickorynut mussel (*Obovaria olivaria*) population was discovered during September 2014. The dive sites were in the vicinity of the Finlay Islands, in the Lac Coulonge reach of the river.





Figure 2. Five species of freshwater mussels collected during SCUBA diving near Finlay Islands, Ottawa River. The species are (clockwise from the upper left): Hickorynuts, *Obovaria olivaria*; Plain pocketbooks, *Lampsilis cardium*; Eastern Elliptios, *Elliptio complanata*; six small Triangle Floaters, *Alasmidonta undulata*; and one Fatmucket, *Lampsilis siliquoidea* (yellowish specimen without stripes). Most of these animals were released exactly where they had been collected; only a few were kept and deposited to the mollusc collection at the Canadian Museum of Nature. The largest Plain pocketbook in the right centre is approximately 11 cm long. Image: André Martel © Canadian Museum of Nature



Figure 3. In situ photograph of a Hickorynut mussel (*Obovaria olivaria*) at a depth of 4 m, south of Finlay Islands in the Ottawa River. The substrate across much of the Lac Coulonge reach is almost pure sand. Image: André Martel © Canadian Museum of Nature.

It is not a coincidence that the “Lac Coulonge” reach of the Ottawa River has such great representations of Hickorynuts. Let’s look at the river for clues. The reach just upstream, called “Allumette Lakes”, as well as the reach further downstream, Lac du Rocher Fendu, are parts of the Ottawa River that are still relatively wild, flowing freely without encountering any dams. It includes several great rapids that are ideal spawning grounds for several fish species, including the sturgeon. It is in this area that Lake Sturgeon populations reach their highest numbers in the Ottawa River (Haxton & Findlay 2008). This is truly a haven for the Hickorynut (and for many other species of unionids) and a natural heritage that must be preserved!

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### St. Croix River *Quadrula nodulata*

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**Nathan Eckert**, **Jorge Buening**, **Tamara Smith**, and **Phil Delphey**, U.S. Fish & Wildlife Service

**Byron Karns**, National Park Service, St. Croix Falls, Wisconsin 54024

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**Dave Heath** and **Lisie Kitchel**, Wisconsin Dept. of Natural Resources

The wartyback, *Quadrula nodulata* (Rafinesque, 1820), until recently, was quite rare in Minnesota. Mussel surveys conducted between 1965 and 1996 revealed few live individuals, which prompted the Minnesota DNR to list the species as endangered in 1996. In 1997 and 2002, *Q. nodulata* was found in some abundance in the Mississippi River from the Twin Cities to upper Pool 3 (Havlik 1997, Havlik 2002, Kelner and Davis 2002). The mouth of the St. Croix River lies along this reach of the Mississippi River but no live *Q. nodulata* have been noted during any of several mussel surveys of the St. Croix River (Hornbach 2001).

During a recent mussel monitoring effort, a single, young *Q. nodulata* was collected from the St. Croix River downstream of the dam at St. Croix Falls, Wisconsin. Dense and diverse mussel communities live near St. Croix Falls and Hudson, Wisconsin, and these sites have been monitored approximately every 5 years since 1987. Over time, this monitoring project has grown into a multi-agency effort and was repeated during August 2014. At the St. Croix Falls site, 150 locations were randomly selected for 1 m<sup>2</sup> quadrat sampling. All mussels collected from a quadrat were identified, and height, length, and age were recorded. River bed composition was visually estimated for each quadrat. We also conducted several timed searches. During these efforts, we observed four federally listed mussel species, including live *Cumberlandia monodonta*\*, *Epioblasma triquetra*\*, *Lampsilis higginsii*, and *Q. fragosa* (\* several age classes). Additionally, numerous state-listed species were recorded, including a single live *Q. nodulata* (length 26 mm, height 21 mm, age 3 yr) from a quadrat sample. The characters we used to identify this specimen as *Q. nodulata* were: three aligned medial pustules, few pustules, shiny light greenish-tan periostracum, round shell outline, white nacre, no green ray on umbone, and no sulcus. This specimen was preserved and will be deposited at the Bell Museum of Natural History, University of Minnesota.

This is the first record of a live *Q. nodulata* from the St. Croix River, and is an important find for Minnesota and Wisconsin. This species is very rare in the St. Croix. We found no records of this species from the St. Croix River from regional museums, and several past surveys only generated three reports of empty shells: Douglas Co. (Graf 1997), downstream of Stillwater, MN (Havlik 1987), and immediately downstream of old highway bridge at Prescott, WI (D. Heath (unpub.)). The St. Croix River holds several dense and diverse mussel beds, which suggests *Q. nodulata* could grow in abundance. *Quadrula nodulata* is currently listed as threatened in both Minnesota and Wisconsin. We plan to continue monitoring the reaches at St. Croix Falls and Hudson to assess changes in habitat and mussel populations, like *Q. nodulata*.



*Quadrula nodulata* found near St. Croix Falls, Wisconsin. (Photo by Queenan Productions)



Specimen beak sculpture (photo by Andy Edcumbe)



Mussels collected during a 15 min timed search (pictured left to right, Byron Karns, Dan Kelner, Zeb Secrist, Caitlin Luebke, Andy Edgcumbe, and Aaron McFarlane). (Photo by Queenan Productions)

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## 2014 Tennessee's Mollusk Recovery Program Achievements

**Don Hubbs**, TWRA Mollusk Recovery Program Coordinator

The Tennessee Wildlife Resources Agency (TWRA) is the regulatory body primarily responsible for conservation and management of Tennessee's mollusks and other biological resources. This report is compilation of the annual mollusk restoration efforts by TWRA by river and site with details of actions taken to aid the recovery of this important aquatic resource.

As in 2013, above average rainfall during 2014 challenged TWRA's efforts toward reintroduction and recovery efforts aimed at restoring freshwater mussel species diversity and distribution in Tennessee. In cooperation with Dr. Paul Johnson at the Alabama Aquatic Biodiversity Center, we were able to reintroduce 802 sub-adult federal endangered Pale Lilliput (*Toxolasma cylindrellus*) into the Duck River. Three additional federal endangered mussel species populations in the Duck River were augmented: fanshell (*Cyprogenia stegaria*), Cumberlandian Combshell (*Epioblasma brevidens*), and Fluted Kidneyshell (*Ptychobranthus subtentum*). Pink mucket populations were augmented in the Clinch and Cumberland rivers, with sub-adults propagated by Virginia Department of Game and Inland Fisheries (VDGIF) and grown out to stock size by TWRA. Four endangered Cumberlandian mussel species (*Epioblasma*

*brevidens*, *Epioblasma capsaeformis*, *Lemiox rimosus*, and *Ptychobranthus subtentum*) were stocked into an established restoration site in the Nolichucky River by collecting adult wild stock from the Duck and Clinch rivers, and stocking sub-adults produced by VDGIF. The Emory River mussel population was augmented with 149 *E. capsaeformis* sub-adults propagated by VDGIF and 500 adult wild stock Moccasinshells (*Medionidus conradicus*) collected from the Clinch River. One site in the Hiwassee River was augmented with 500 sub-adult *E. capsaeformis* propagated by Virginia Tech.

In total, 6,742 mussels of 11 species, including 7 federally endangered species, were stocked into seven different sites in Tennessee waters during 2014. This work would not be nearly as successful without the assistance of our state partners in Alabama and Virginia. Over 35% of the mussels stocked during 2014 were 1+ year old sub-adults provided to TWRA by our partners at Alabama Department Wildlife Resources - Alabama Aquatic Biodiversity Center, VA Tech's Freshwater Mollusk Conservation Center, and Virginia Department of Game and Inland Fisheries - Aquatic Wildlife Conservation Center in exchange for brood stock to use in their respective restoration programs. Over the past 11 years, we have stocked over 50,000 mussels representing 35 species at 18 sites across in 10 different rivers in Tennessee.

## Recent Observation of *Leptoxis* from the Rockcastle River, Kentucky

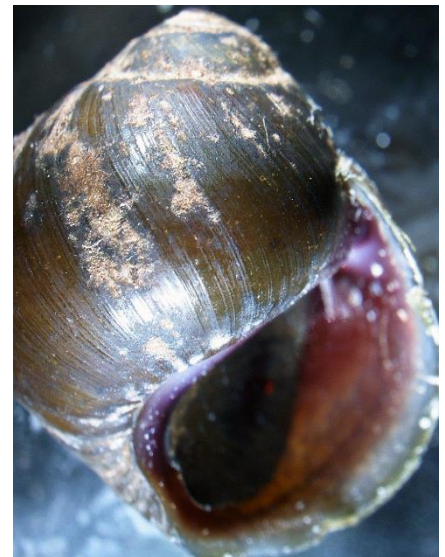
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In September 2014, during a mussel survey in the middle sections of Rockcastle River, a tributary to the Cumberland River, biologists from Kentucky Department of Environmental Protection observed an unusual *Leptoxis*. This species appears to be different from the *Leptoxis* present in some Ohio River tributaries in the state, which is *Leptoxis praerosa*. Initial identifications suggest that this species could be *Leptoxis umbilicata* (Weatherby, 1876), based on the presence of a shallow umbilicus in some adult individuals. This would represent the first known record of *L. umbilicata* from Kentucky. The most recent Cumberland River system *Leptoxis* records published from Kentucky were referred as *L. praerosa* (Branson and Batch, 1982; Branson and Batch, 1987). Goodrich (1934, 1940) reported *Leptoxis praerosa* as occurring in the mainstem and tributaries of the Cumberland River. While there have been suggestions that *L. umbilicata* is part of a *L. praerosa* group, the nomen was still considered valid by Turgeon *et al.* (1998) and Johnson *et al.* (2013). Field observations suggest that populations are highly localized in the Rockcastle River and restricted to areas with moderate flow.

These *Leptoxis* are globose and have a characteristic purple periostracum within the apertural opening. Specimens of *Leptoxis praerosa* from the state are typically characterized as being less globose (often more bluntly conical) and having characteristic deep maroon striping in the aperture. Future molecular work is needed to determine the exact species identity of this *Leptoxis* population and to clarify the taxonomy of *L. praerosa* and *L. umbilicata* in the Cumberland basin and elsewhere. If this species is found to be a valid taxon, it is undoubtedly rare and likely in need of conservation action, such as determination of occupied habitats, population viability, and threats to survival.



Putative *Leptoxis umbilicata* from the Rockcastle River, Kentucky. Photo: Ryan Evans, KY DEP – Div. of Water



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### **New Records for the Lilliput (*Toxolasma parvum*) and Pistolgrip (*Quadrula verrucosa*) in the Ohio River, Allegheny County, Pennsylvania.**

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Specimens of the Lilliput (*Toxolasma parvum*) and the Pistolgrip (*Quadrula verrucosa*) were encountered during recent freshwater mussel sampling in the Dashields Pool on the Ohio River, downstream of Neville Island, Coraopolis, Neville Township, Allegheny County, Pennsylvania,. These are the first records for both of these species in the Ohio River below Pittsburgh in over 100 years.

The Lilliput was historically rare in Pennsylvania and reported only in the outlet of Conneaut Lake, a tributary of French Creek in the Allegheny River basin (Ortmann, 1919). Rhoads (1899) reported the Lilliput from the Beaver River, Lawrence County, however, Ortmann (1919) felt this was most likely a misidentification of *Villosa fabalis*. Tanner (1970a, b) reported this species from a late prehistoric archaeological site at Godfrey on the Allegheny River, and a fresh dead specimen was found at Johnetta, both in Armstrong County. In July 1996, the U.S. Geological Survey collected a 25 mm long specimen from the Monongahela River at River Mile 5, in Pittsburgh, Allegheny County (Anderson, 1997). That specimen was deposited in the Mollusk Collection of the Carnegie Museum of Natural History (CM 47389). More recently, R. Winters collected two modern specimens of the Lilliput in 2007 from the Allegheny River, Godfrey, Armstrong County, Pennsylvania (CM 79750). During recent



Figure 1. *Toxolasma parvum* from the Ohio River, left descending bank, Allegheny County, Pennsylvania (CM 140172). Total length is 18.1 mm

freshwater mussel survey work in the Dashields Pool on the Ohio River, downstream of Neville Island, Coraopolis, Neville Township, Allegheny County, Pennsylvania, a single dead right valve of the Lilliput



(*Toxolasma parvum*) was collected August 25, 2014 on the left descending bank of the Ohio River at River Mile 10.35 by Michael J. Myers. This specimen has been deposited in the Mollusk Collection of the Carnegie Museum of Natural History (CM 140172).

During the SCUBA dive survey of the same section of the Ohio River, across from Coraopolis, Allegheny County, Pennsylvania, a single live, large, adult female specimen of the Pistolgrip was recovered, photographed, measured, and returned to the area where it was collected. This is the first record of *Quadrula verrucosa* from the Ohio River in modern time. Rhoads (1899) reported the Pistolgrip from the Ohio River at Coraopolis, Allegheny County, and from the Beaver River at Wampum Pennsylvania. Ortmann (1919) noted the Pistolgrip as rather scarce in the Ohio, Monongahela, and Allegheny River basins, more common in the Beaver River, and most abundant in Dunkard Creek. He noted specimens collected from the Beaver, Mahoning, Shenango, and Allegheny rivers and from Pymatuning and Dunkard creeks. The species has been collected more recently in western Pennsylvania from Dunkard Creek, Greene County, Pennsylvania (ANSP 397188) in 1989 by C. Bier and in 1993 by the senior author (AB) (NCSM 43730). The Malacology Collection at the Carnegie Museum of Natural History has two lots of the Pistolgrip collected from the Shenango River, Mercer County, Pennsylvania: CM 76350 collected by C. Bursey in 1984 (Bursey, 1987) and CM 81682, collected by R. Evans in 2002. *Quadrula verrucosa* is listed by the Pennsylvania Fish and Boat Commission as State Endangered.



Figure 2. *Quadrula verrucosa* female, collected alive from near the right descending bank of the Ohio River, Allegheny County, Pennsylvania. Total length is 161 mm.

#### Acknowledgments:

Hanson Aggregates BMC, INC. funded the freshwater mussel survey in Dashields Navigation Pool. Dr. Timothy Pearce is gratefully acknowledged for his help in checking the Carnegie Museum of Natural History Mollusk Collection and cataloging our recent valve of *Toxolasma*.

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### Flutedshell (*Lasmigona costata*) Natural Hosts and Glochidia Release Behavior

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The flutedshell (*Lasmigona costata* (Rafinesque, 1820)) occurs throughout east central North America but is rare in places (Cummings and Mayer 1992). Living in medium or large rivers, this mussel is a Threatened Species in Minnesota. We recently completed laboratory host suitability trials to improve flutedshell conservation efforts (Thomason *et al.*, 2013, Hove *et al.*, 2014). To compliment this work, we undertook the following research objectives: (1) determine natural *L. costata* hosts, and (2) describe glochidia release behavior.

We used standard methods to collect and identify juvenile mussels from naturally infested fishes (Hove *et al.*, 2012). During 2012-13, we collected a variety of fishes from the Sunrise River below Kost Dam, Chisago County, Minnesota, and held them in species-specific aquaria in the laboratory. We checked the aquaria periodically and recovered a variety of juvenile mussels, which were photographed using a scanning electron microscope. Seven Anodontines may occur in the Sunrise River (Davis and Miller 1996, Hornbach 2014). *Anodontoidea ferussacianus* and *Lasmigona compressa* have been collected in the past but were rare. The smaller glochidial shell dimensions of *A. ferussacianus*, *L. compressa*, and *L. complanata* were distinguishable from species with similarly shaped glochidia (Table 1). Juvenile mussels from naturally infested fishes were separated into groups using glochidial shell outline, and juvenile *L. costata* were identified using discriminant analysis of glochidial shell height, length, and hinge length (DA) (JMP v.11) (Table 2).

Table 1. Glochidial shell dimensions of Sunrise River Anodontines. Shell dimensions with different superscripts were significantly different (P<0.05).

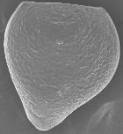
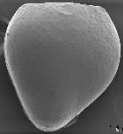
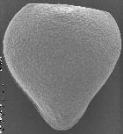
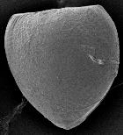
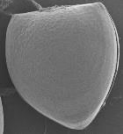
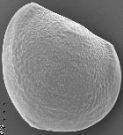
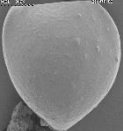
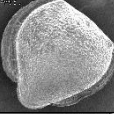

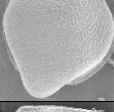
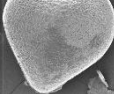
Species	Height ± 1 std dev (μ)	Length ± 1 std dev (μ)	Hinge length (μ)	Picture (Not to scale)
<i>Lasmigona costata</i>	393±10 <sup>a</sup>	362±10 <sup>a</sup>	253±9 <sup>a</sup>	
<i>Alasmidonta marginata</i>	389±9 <sup>a</sup>	345±8 <sup>b</sup>	236±7 <sup>b</sup>	
<i>Lasmigona complanata</i>	325±11 <sup>b</sup>	312±12 <sup>c</sup>	207±10 <sup>c</sup>	
<i>Pyganodon grandis</i>	368±8 <sup>a</sup>	372±10 <sup>a</sup>	276±7 <sup>a</sup>	
<i>Anodontoidea ferussacianus</i>	320±23 <sup>b</sup>	324±2 <sup>b</sup>	247±22 <sup>b</sup>	
<i>Strophitus undulatus</i>	303±8 <sup>a</sup>	371±14 <sup>a</sup>	281±13 <sup>a</sup>	
<i>Lasmigona compressa</i>	279±6 <sup>b</sup>	328±13 <sup>b</sup>	237±11 <sup>b</sup>	

Table 2. Juvenile *Lasmigona costata* recovered from naturally infested Sunrise River fishes.

Recovered from	Height $\pm$ 1 std dev ( $\mu$ )	Length $\pm$ 1 std dev ( $\mu$ )	Hinge length ( $\mu$ )	Picture (Not to scale)	Predicted mussel species (DA prediction probability)
<i>Notemigonus crysoleucas</i> (golden shiner)	398	363	252		<i>L. costata</i> (82%)
<i>Semotilus atromaculatus</i> (creek chub)	419	379	258		<i>L. costata</i> (86%)
<i>Semotilus atromaculatus</i> (creek chub)	394	363	249		<i>L. costata</i> (79%)
<i>Catostomus commersonii</i> (white sucker)	381	363	256		<i>L. costata</i> (98%)

We observed *L. costata* release glochidia in the laboratory. Four gravid flutedshell were collected from the Sunrise River on April 2, 2014. They were placed in individual aquaria where water temperature was raised from 1 to 21 °C through the month. Between May 27–June 5, each mussel released a mass of unattached glochidia. Many of the glochidia from 3 of 4 females were opening and closing without exposure to salt. No juvenile mussels were observed among the glochidia.

These results add to our knowledge of *L. costata*. Discriminant analyses gave high prediction probabilities for identifications of unknown juveniles. Our observations of *L. costata* naturally transforming on white suckers, creek chubs, and golden shiners were consistent with previous research. Weiss and Layzer (1995) observed flutedshell naturally infest another catostomid, the river redhorse. *Lasmigona costata* have metamorphosed on catostomids and cyprinids in the laboratory, as well as on several other fish families (Luo 1993, Hove *et al.*, 1994, Watters *et al.*, 1998a, Watters *et al.*, 1998b, Watters *et al.*, 2005, Tomason *et al.*, 2013, Hove *et al.*, 2014). We observed flutedshell release individual glochidia, which is similar to observations described in Ortmann (1910).

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### Host Fishes and Glochidia Release Behavior of *Elliptio dilatata*

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The spike, *Elliptio dilatata*, is a widespread and locally abundant mussel in much of the Mississippi and Great Lakes regions (Haag 2012, Parmalee and Bogan 1998), although populations are declining and have been extirpated in some areas (Parmalee and Bogan 1998, Sietman 2003, Watters *et al.*, 2009). There is little information on its hosts and glochidia release behavior. To examine these life history characters, we collected gravid *E. dilatata* from the St. Croix River at Franconia and Wild River State Park, Minnesota, in July and August 2014. Mussels were maintained in the laboratory at room temperature and mature glochidia were released 1 and 18 days after collection. Glochidia were released individually or in small clumps in association with a clear mucosal web (Figure 1). Potential host fishes of various families were inoculated using standard procedures (Zale and Neves 1982, Hove *et al.*, 2000). In addition to gills, glochidia frequently attached to fins and external soft tissues. We examined samples twice a week and successful juvenile transformations were counted and preserved. Of 54 fish species and one amphibian (mudpuppy, *Necturus maculosus*) tested, 31 species were suitable hosts (Table 1).



Figure 1. *Elliptio dilatata* glochidia: (left) glochidia released in a laboratory holding cell, (middle) mucous bound glochidia drawn up with a pipette, (right) scanning electron micrograph of a glochidium (x350).



Table 1. Suitable host species for *Elliptio dilatata*.

Fish Species	No. Fish Inoculated	Juveniles Transformed	Fish Species	No. Fish Inoculated	Juveniles Transformed
<b>Anguillidae</b>			<b>Gadidae</b>		
<i>Anguilla rostrata</i> *	4	50	<i>Lota lota</i>	1	3
<b>Centrarchidae</b>			<b>Gasterosteidae</b>		
<i>Ambloplites rupestris</i>	2	30	<i>Culaea inconstans</i>	2	78
<i>Lepomis cyanellus</i> *	5	60	<b>Lepisosteidae</b>		
<i>Lepomis gibbosus</i>	1	19	<i>Lepisosteus osseus</i>	2	34
<i>Lepomis gibbosus x L cyanellus</i>	1	10	<b>Percidae</b>		
<i>Lepomis macrochirus</i> *	13	91	<i>Ammocrypta pellucida</i>	1	10
<i>Lepomis megalotis</i>	2	25	<i>Etheostoma caeruleum</i>	12	255
<i>Micropterus dolomieu</i> *	2	79	<i>Etheostoma exile</i>	2	19
<i>Micropterus salmoides</i> *	4	592	<i>Etheostoma nigrum</i>	12	1235
<i>Pomoxis nigromaculatus</i>	2	102	<i>Etheostoma zonale</i> *	12	32
<b>Cyprinidae</b>			<i>Perca flavescens</i> *	15	890
<i>Notemigonus crysoleucas</i>	5	1	<i>Percina caprodes</i> *	9	568
<i>Rhinichthys cataractae</i>	1	3	<i>Percina evides</i>	2	13
<b>Escocidae</b>			<i>Percina maculata</i> *	13	273
<i>Esox lucius</i>	1	21	<i>Percina phoxocephala</i> *	13	65
<b>Fundulidae</b>			<i>Percina shumardi</i> *	6	14
<i>Fundulus diaphanus</i>	2	21	<i>Sander canadensis</i>	2	143
<i>Fundulus olivaceus</i> *	2	113	<i>Sander vitreus</i>	2	591

\* Indicates species produced juveniles in two or more trials

Species that were not suitable hosts (number inoculated): *Amia calva* (2), *Lepisosteus platostomus* (1), *Catostomus commersonii* (2), *Erimyzon oblongus* (1), *Ictiobus cyprinellus* (2), *Hypentelium nigricans* (1), *Moxostoma macrolepidotum* (1), *Ameiurus melas* (3), *Ictalurus furcatus* (10), *Ictalurus punctatus* (6), *Noturus gyrinus* (2), *Pylodictis olivaris* (2), *Campostoma anomalum* (1), *Cyprinella spiloptera* (6), *Cyprinella lutrensis* (2), *Cyprinus carpio* (2), *Semotilus atromaculatus* (2), *Rhinichthys atratulus* (2), *Notropis dorsalis* (4), *Notropis volucellus* (2), *Pimephales notatus* (4), *Pimephales vigilax* (2), and *Necturus maculosus* (2)

Transformation was broadly successful and greatest on species of Percidae and Centrarchidae, with generally lower levels of success on species in several additional families. The ability to use a range of host species, particularly benthic species such as darters and perches may explain, in part, *E. dilatata*'s occurrence in both small streams and larger rivers.

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### **Laboratory-determined Hosts for the Ohio Pigtoe, *Pleurobema cordatum* (Rafinesque, 1820)**

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Laboratory transformations are reported for the Ohio Pigtoe, *Pleurobema cordatum* (Rafinesque, 1820), an Ohio Endangered species. The mussels were collected from the Muskingum River below Devola Lock & Dam #2 in Washington County, Ohio. Potential hosts were derived from a variety of sources, but none were from the Muskingum River. Female Ohio Pigtoes released numerous, ladder-shaped, white conglutinates, some of which were fed to the test fishes to initiate infections. In addition to the fishes listed in the table, the following fishes were tested but did not transform any glochidia: bluntnose minnow, striped shiner (two trials), emerald shiner, red dace, stoneroller (four trials), madtom, yellow perch, large mouth bass (two trials), and long-eared sunfish.

<b>Fish species</b>	<b>Days to transformation</b>	<b># Juveniles</b>	<b>% Transformed</b>	<b>Temp C</b>	<b>Date Infected</b>
scarlet fin shiner	9	27	57.50%	21.5	7/15/2014
scarlet fin shiner	13	32	38.10%	21.5	7/15/2014
blacknose dace	8	44	31.80%	21.5	7/15/2014
blacknose dace	N/A			21.5	7/15/2014
blacknose dace	N/A			21.5	7/15/2014
white sucker	9	6	8.60%	21.5	7/15/2014
guppy	15	3	8.33%	21.7	7/15/2014
creek chub	13	4	7.27%	21.5	7/15/2014
bluntnose minnow	8	10	7.14%	21.5	7/15/2014
creek chub	8	12	20.00%	21.5	7/15/2014
creek chub	13	3	3.23%	21.5	7/15/2014
creek chub	8	1	1.30%	21.5	7/15/2014
creek chub	8	1	1.00%	21.5	7/15/2014
creek chub	13	1	0.70%	21.5	7/15/2014
creek chub	N/A			21.5	7/15/2014
spotfin shiner	9	2	0.30%	21.5	7/17/2014

## On the Presence and Status of *Paludinella globularis* and *Paludinella sicana* in Israel (Mollusca, Gastropoda, Assimineidae)

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Although the gastropod family Assimineidae is usually included among the marine gastropods, most species are amphibious and air-breathing, and found primarily in brackish water estuaries (Kay, 1979). In the tropics, a number of species are more associated with freshwater than with brackish water, and some are even completely terrestrial (Brandt, 1974). For this reason, the Assimineidae are often included among the inland molluscs (Mienis & Ortal, 1994; Giusti *et al.*, 1995; Falkner *e al.*, 2002) but, for unknown reasons, they have been excluded from the updated list of aquatic inland molluscs of Israel (Mienis, 2012).

In Israel, the Assimineidae are represented in the Eastern Mediterranean by a single genus: *Paludinella* Pfeiffer, 1841. Avnimelech & Boskovitz (1955) mentioned *Assiminea littorina* (Delle Chiaje, 1828) from Haifa Harbour, and Barash & Danin (1992) reported the same species as *Paludinella littorina* (Delle Chiaje, 1828) from the beaches of Haifa and Shiqmona. Recently, Kadolsky (2012) has pointed out that *Helix littorina* had been based on a juvenile specimen of *Melaraphe neritoides* (Linnaeus, 1758) and that the current name for *Paludinella littorina* auct. should be *Paludinella globularis* (Hanley in Thorpe, 1844). All local shells of *Paludinella globularis* seen so far were found as empty shells on the beach.

In the collections of the Hebrew University of Jerusalem (HUJ) and the Tel Aviv University (TAU MO) I found only a single sample: Mikhmoret, leg. U. Safrieli, 3 April 1964 (TAU MO 58874/4).

During a survey of the distribution of the Mouse-ear snail *Phytia myosotis* (Draparnaud, 1801) [now usually called *Myosotella myosotis*] in Israel carried out by Orli Mienis (1989), living specimens of a second species, *Paludinella sicana* (Brugnone, 1876), were found near a saltpan and on the banks of a river: Atlit, on the banks of the most north-western saltpan, leg. O. Mienis & H.K. Mienis, 9 November 1988 (HUJ 1650/5); Tel Aviv, Yarqon River, north bank, 50 m east of Ibn Gvirol bridge, leg. O. Mienis & H.K. Mienis, 19 October 1988 (HUJ 1605/1); idem, just west of outlet Reading Power Station, west of entrance Nahal Ayalon in the Yarqon, leg. O. Mienis & H.K. Mienis, 19 October 1988 (HUJ 1606/2); idem, 26 October 1988 (HUJ 1607/4).

In the HUJ- and TAU-collections, two additional samples of empty shells were found: Tantura beach, leg. G. Haas, July 1949 (HUJ 1604/1) and Tel Aviv, beach between Separate Beach and the Old Harbour, leg. H.K. Mienis, 4 March 2002 (TAU MO 40561/3).

On the banks of the Yarqon River, the snails were found under Sea purslane *Atriplex portulacoides*, often together with specimens of the Mouse-ear snail *Phytia myosotis*. On the banks of the saltpan in Atlit, the snails were found around the base of Glasswort *Salicornia europaea*.

At least the lower part of the Yarqon River can be classified as a typical brackish water biotope. Similar stretches with Sea purslane and Glasswort on the banks are known from other Mediterranean coastal rivers in Israel but, so far, we have looked there in vain for additional populations of *Paludinella sicana*.

The saltpans in Atlit are not operational anymore and the ecological situation is rapidly changing. Fairly recently, we have looked there in vain for the once common *Phytia myosotis*. *Paludinella sicana* was never very common, so it is doubtful whether it is still living in Atlit.

The lower parts of the Mediterranean coastal streams inclusive the Yarqon River near Tel Aviv are suffering from time to time from urban and industrial pollution. Consequently *Paludinella sicana* is considered at least as an endangered species in Israel.

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### **Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel *Sinanodonta woodiana*, 37. News from the Czech Republic, Germany, Poland and Ukraine**

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Papers dealing with the presence of the invasive Chinese Pond mussel *Sinanodonta woodiana* (Lea, 1834) in Europe continue to appear. Here is some new information from the Czech Republic, Germany, Poland, and Ukraine.

#### **Czech Republic**

Kubín (2013) recorded the Chinese Pond mussel for the first time from Moravian Wallachia in the Czech Republic. Specimens were found in the Zuberský Stream in May 2013 and Lake Horní Hamerský in June 2013. This invasive mussel species had been reported already from numerous other localities in the Czech Republic.

#### **Germany**

In the annual report of the Department of Environmental Protection of the Ilm region in Thüringen for the year 2012, a few lines are dedicated to the discovery of large numbers of Chinese Pond mussels when ponds were emptied in the Pennewitz area in 2012 (Anonymous, n.d.).

#### **Poland**

The results of DNA sequences of the mitochondrial *cox1* gene in 4 new populations of *Sinanodonta woodiana* from Poland and a single population from Hungary showed identical sequences (Soroka *et al.*, 2014). They were also similar to gene sequences of specimens from Hungary, Italy, and Ukraine already present in the GenBank, but differed from the DNA-sequences of some Romanian populations in the GenBank. It is postulated that the Polish populations were all imported from Hungary, but populations living in Romania reached that country most probably from at least two different sources.

#### **Ukraine**

Until fairly recently, 10 taxa were recognized within the Anodontinae occurring in Ukraine. A recent research of the DNA of the various morphological types present in the waters of Ukraine revealed that only 4 species can be recognized: 3 local species (*Anodonta cygnea*, *Anodonta anatina* and *Pseudanodonta complanata*) and one exotic species *Sinanodonta woodiana*. Two populations of the Chinese Pond mussel



were used for this survey: one from the Lower Danube near the town of Vylkova and the other from the Latorytsa River near Chabanivka (Mezhzherin *et al.*, 2014).

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## New Shelling and Additional Geographical Records in the Arapey River Basin, Salto Department, Oriental Republic of Uruguay, Southern Cone of South America

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As much as one visits and searches in a geographic region, it never ceases to amaze us, every new opportunity, with the discovery of new forms of local mollusks. Such is the case of the “pampean region” of Salto Department, in the Oriental Republic of Uruguay, domain of the great Uruguay River basin and immediate neighbor of the Brazilian territory to the south. We have been systematically visiting this area since 2006 (Agudo-Padrón 2006, 2008, 2012, 2014).

On October 14-16 2014, during a period of abundant rainfall, we made a visit for limnic shelling in the region of “Termas de Arapey”, specifically on the public sector of the bathhouse on the riverfront of “Arapey Grande River.” In the small streams and lagoons populated by dense colonies of aggregative algae formed by continuous flow of mineral waters that flow from the pools (Figure 1), we found two new native species of aquatic snails: the AMPULLARIIDAE *Pomacea lineata* (Spix, 1827) and the PLANORBIDAE *Biomphalaria tenagophila tenagophila* (d’Orbigny, 1835) (Figure 3), limnic mollusks previously referred in the literature for the country (Scarabino 2004).



Figure 1.- Artificial streams and lagoons formed by continuous flow of hot springs from the pools. The river channel is in the distance.



Figure 2. PLANORBIDAE  
*Biomphalaria tenagophila tenagophila*  
(d'Orbigny, 1835)

The accompanying limnic mollusk fauna detected at the time of collection included exclusively the native species AMPULLARIIDAE *Pomacea canaliculata* (Lamarck, 1804) (Figure 3) and the PLANORBIDAE *Drepanotrema pfeifferi* (Strobel, 1874).



Figure 3.- AMPULLARIIDAE *Pomacea canaliculata* (Lamarck, 1804)

Finally, and for the first time, two species of native terrestrial gastropod mollusks were detected in this locality strongly anthropized area, hidden under loose basaltic rocks: the slug VERONICELLIDAE *Phyllocaulis soleiformis* (d'Orbigny, 1835) and the snail BULIMULIDAE/ ORTHALICIDAE *Bulimulus sporadicus* (d'Orbigny, 1835), both also previously referred in the literature for the country (Scarabino 2003) but under the “presumptive” synonym *Bulimulus bonariensis bonariensis* (Rafinesque, 1815)

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## New Geographical Records of Continental Mollusks for Joinville Municipal District, North Atlantic Slope Section of Santa Catarina State/ SC, Southern Brazil

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Giving continuity to the regional survey, and based on recent literature review (Agudo-Padrón *et al* 2013a, Agudo-Padrón 2014, Agudo-Padrón & Funez 2014) and the examination of samples obtained in the course of works done in the field (Figure 1), the present contribution incorporates the geographical records of four more continental mollusks for the Municipal District of “Joinville”, Northern region of the State. These species are all included in previous systematic inventories of known continental mollusks of the Santa Catarina’s State/ SC (Agudo-Padrón 2014), central portion of southern Brazil region.



Figure 1.- The third author of this contribution, Mayara Vitorino, in the field on the Cubatão River Basin (left), and the Municipal District of Joinville (red color) in the geographical context of Santa Catarina/ SC State territory (right).



Freshwater forms

HYDROBIIDAE

*Littoridina piscium* (d'Orbigny, 1835) (Figure 2) – Cubatão River, Joinville, September 2014, in silty substrate of the river (very polluted area, clearly affecting the external structure of the shells). 32 specimens with aprox. 6,79 mm.



Figure 2.- HYDROBIIDAE *Littoridina piscium* (d'Orbigny, 1835) of Cubatão River. Photographs by Mayara Vitorino, Joinville, SC

AMPULLARIIDAE

*Pomacea sordida* Swainson, 1823 (Figure 3) – Cubatão River, Joinville, September 2014, in silty substrate of the river (very polluted area, clearly affecting the external structure of the shells) 1 specimen.

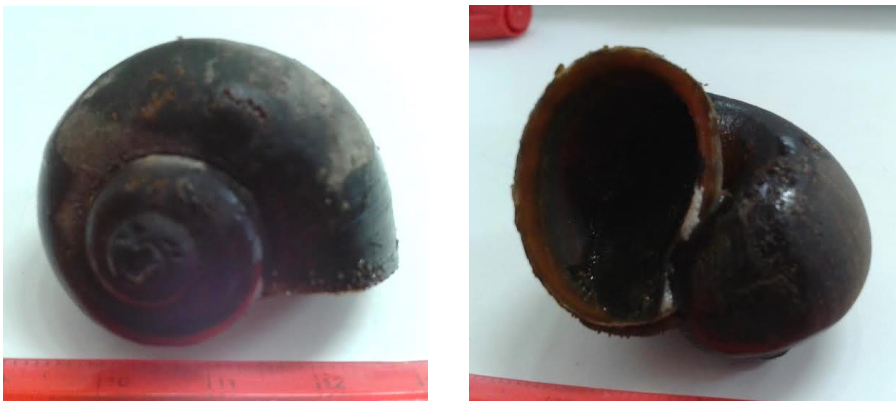


Figure 3.- AMPULLARIIDAE *Pomacea sordida* Swainson, 1823 of Cubatão River. Photographs by Mayara Vitorino, Joinville, SC

CORBICULIDAE

*Corbicula largillierti* (Philippi, 1844) (Figure 4) – Cubatão River, Joinville, September 2014, in silty substrate of the river (very polluted area) 1 specimen.

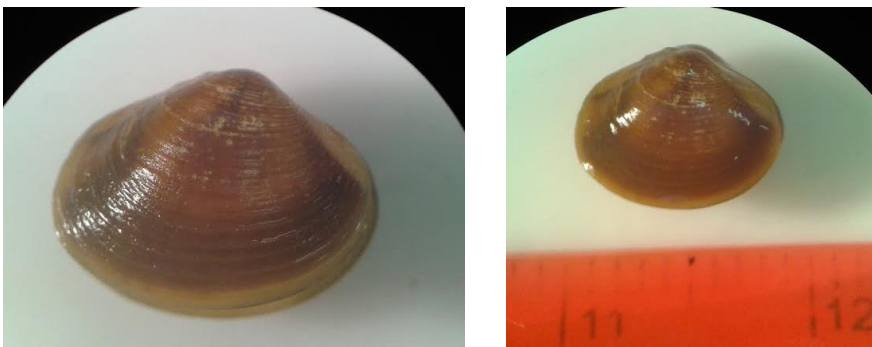


Figure 4.- CORBICULIDAE *Corbicula largillierti* (Philippi, 1844) of Cubatão River. Photographs by Mayara Vitorino, Joinville, SC

Terrestrial forms

## MEGALOBULIMIDAE

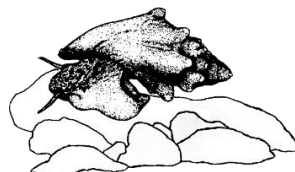
*Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900) (Figure 5) – near Joinville, August 26-27 2013, on wasteland land located in the North sector of the city. 7 specimens, breeding adults. Previously reported for “Garuva” Municipal District, neighbor to North of Joinville (Agudo-Padrón *et al* 2013 b), with the present report is extended even further to known zoogeographic distribution of the species in the southern Brazil territory (Miranda *et al* 2014).



Figure 5.- Forest land snail MEGALOBULIMIDAE *Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900) of Joinville, Santa Catarina/ SC. Photographs by Mozart de Souza, Joinville, SC

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*Ellipsaria* is posted on the FMCS web site quarterly: early in March, June, September, and December. This newsletter routinely includes Society news, abstracts, job postings, meeting notices, publication announcements, informal articles about ongoing research, and comments on current issues affecting freshwater mollusks. Anyone may submit material for inclusion in *Ellipsaria*; however, only current dues-paying members of FMCS can access the two most recent issues. Older issues are accessible to anyone. Information for possible inclusion in *Ellipsaria* should be submitted via e-mail to the editor, John Jenkinson, at [jjjenkinson@hotmail.com](mailto:jjjenkinson@hotmail.com).

Contributions may be submitted at any time but are due by the 15<sup>th</sup> of the month before each issue is posted. MSWord is optimal for text documents but the editor may be able to convert other formats. Graphics should be in a form that can be manipulated using PhotoShop. Please limit the length of informal articles to about one page of text. Note that submissions are not peer reviewed but are checked for clarity and appropriateness for this freshwater mollusk newsletter. Feel free to contact the editor with questions about possible submissions or transmission concerns.



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## Parting Shot



This friendly live threeridge (*Amblema plicata*) greeted the Ecological Specialists dive crew during a recent monitoring survey in the Cordova *Lampsilis higginsii* Essential Habitat Area, at approximate River Mile 505.5, Pool 14, on the Mississippi River. It and other mussels relocated from a construction site a few miles downstream had been marked and placed in a monitoring grid at this location in 1999. The crew was very surprised and encouraged by this recapture 15 years later. Photograph by Ryan Foley.

If you would like to contribute a freshwater mollusk-related image for use as a **Parting Shot** in *Ellipsaria*, e-mail the picture, informative caption, and photo credit to [jjjenkinson@hotmail.com](mailto:jjjenkinson@hotmail.com).

