



Newsletter of the Freshwater Mollusk Conservation Society
Volume 18 – Number 3 **September 2016**

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It's Time to Plan, Submit, and Get Ready for our 2017 Symposium in Cleveland, Ohio!

Becca Winterringer, Local Co-chair

As you probably know by now, the 10th Biennial FMCS Symposium will be held on March 26 -30, 2017, at the Cleveland Downtown Marriott at Key Center, in Cleveland, Ohio, USA. Not only is Cleveland still celebrating the 2016 National Basketball Association Championship win and decompressing from the Republican National Committee Convention, but the city

is excitedly waiting for over 200 freshwater mollusk enthusiasts to *aggregate* for four days in our fair city. Beginning on Sunday (March 26) and continuing through Thursday (March 30, 2017), our Society will be convening once again to share success stories, horror stories, interesting and rare finds, new ideas, and lessons learned over the past two years. Now is the time for you to start thinking about your presentation, what you want to donate for the auction, saving your pennies for auction tickets and, of course, hanging on to any baby doll heads that have floated by since the last Symposium.

Those of us on the Local Committee are truly excited to host the 10th Biennial Symposium in Cleveland! We have planned for three days of presentations on a variety of topics that focus on the theme: **Ecosystems, Engineering, Valuation, and Practice – The Roles of Freshwater Mollusks in a Changing Environment**. This Symposium will bring together regulators, researchers, consultants, students, and other freshwater mollusk enthusiasts in a forum that will allow for collaborative opportunities and information exchange. We anticipate four plenary sessions on the following topics:

- Mollusks in Ecosystems – Implications for a Changing Environment
- Mollusks as Ecosystem Engineers - Species to Landscape Level Review
- Value of Mollusks (Monetary, Human, and Ecosystems)
- A Review in Mollusk Research – Lessons Learned from Research to Regulation to Practice

A number of internationally-recognized speakers will present keynote talks on current research on each of these topics and, we expect, will spark debate and interest on research needs concerning the many ways freshwater mollusks affect society and ecosystems.

In addition to the keynote and contributed presentations, we also will host two Workshops. More about those Workshops is presented on Page 4.

Schedule

When planning your trip to Cleveland, keep in mind that we will follow a similar schedule as during past symposia. The two full-day Workshops, the Board Meeting, and an opening reception will occur on Sunday, the three full days of platform presentations will happen Monday through Wednesday, the poster session will be Monday evening, our infamous Steve Ahlstedt will be at the helm for the auction on Tuesday evening, music and mixer will occur on Wednesday evening, and a couple of field trips will take place on Thursday.

Something New: A Student – Mentor Mixer!

In response to a request from students at the St. Charles Symposium, we are organizing a mixer to make it easier for students to have one-on-one discussions with established professionals working on freshwater mollusks. If you would like to be part of this initial gathering, either as a mentor or as a mentee, please contact Megan Bradley at Megan_Bradley@fws.gov. We will be providing more information about this mixer on the registration form.

Registration

Registration for the Cleveland Symposium will open on September 30, 2016. Watch your email and the event website:

(http://molluskconservation.org/EVENTS/2017Symposium/2017_FMCS-Symposium.html.) for details regarding registration. If you need cost estimates more quickly than that, please contact Becca Winterringer (rwinterringer@trcsolutions.com) or Greg Zimmerman (gzimmerman@enviroscienceinc.com).

Location and Travel

Where will you be staying? The Symposium conference host hotel is the Cleveland Marriott Downtown at Key Center (<http://www.marriott.com/hotels/travel/clcsc-cleveland-marriott-downtown-at-key-center/>) located at [127 Public Square, Cleveland Ohio 44114 USA](#). Conveniently located in the heart of downtown, the Key Center is accessible by car via Interstate 90. The Cleveland Hopkins International Airport is 20 minutes from downtown and ground-transportation vendors and car rental facilities are available. In addition, the Cleveland Rapid Transit Authority (RTA) provides on-boarding in the airport and you can disembark in Tower City, just a short walk across Public Square from the Key Center.



Within walking distance of the hotel are the well known East 4th Street/Gateway District (<http://www.clevelandgatewaydistrict.com/visit/dine/>), a wide variety of eateries and pubs on West 6th Street, the Rock and Roll Hall of Fame, the Cuyahoga River, and Lake Erie. We will make every attempt to allow some time for local exploring in the conference schedule.



To ensure you have a memorable experience in Cleveland, Destination Cleveland has partnered with local restaurants, attractions, shopping venues, spas, and sports and recreation organizations to provide exclusive discount offers through the **Show Your Badge Program**. Destination Cleveland is a non-profit group dedicated to all things Cleveland and was instrumental in helping us plan our meeting. To receive the discounts, you will simply need to show your conference badge when visiting participating partners. We will distribute the list of participating partner venues in the next *Ellipsaria*, so stay tuned!!

Rate and Reservation Information

Discounted lodging will be available at the Downtown Marriott at Key Center, which is directly adjacent to the meeting spaces. Hotel rooms will be \$129/night for standard rooms. Reservations can also be made online or by calling (216) 696-9200.

- Book early to save us the stress of “*Will we meet our room quota?*”
- Be sure to say “**I want the 2017 FMCS/ Symposium Mar2017 rate!**”
- Last day to book rooms at this rate is March 5, 2017
- Ready right now??? [Book your group rate for 2017 FMCS/ Symposium Mar2017](#)

If you are driving, parking at the Downtown Marriott at Key Center is presently \$20.00 per day.

Workshops

Our time in Cleveland will include the opportunity to attend one of two full-day Workshops, both to be held on Sunday, March 26. Here are the offerings:

Unionid Mussels of the Upper Ohio and Great Lakes

Dr. Tom Watters

This workshop will cover all freshwater mussels, including extinct species, known from the upper Ohio River and Great Lakes drainages. Attendees will have hands-on experience identifying these species using a take-home workbook that illustrates and compares all species. Key characteristics, sexually dimorphic differences, and river reach changes in forms will be covered. Species will be discussed in morphologically similar groups, including those pesky “Fuscobemas.”



Gastropod Identification and Sampling Workshop

FMCS Gastropod Status and Distribution Committee

This workshop will provide participants with a background on the biology and ecology of freshwater gastropods, sampling techniques, and taxonomic skills for commonly encountered species. FMCS Gastropod Distribution and Status committee members will lead this workshop, which will be informative and a thorough overview of gastropod taxonomy to family level of North American freshwater snails with emphasis on genera of interest.



More details about each of these Workshops will be presented on the event website: http://molluskconservation.org/EVENTS/2017Symposium/2017_FMCS-Symposium.html. Registration information for these Workshops will be included on the Registration page of the website once it is open.

Field Trips

What would an FMCS Biennial Symposium be without a couple of field trips? We cannot wait to announce our field trips in the next issue of *Ellipsaria*. We promise that one will include a brewery tour. The other field trip is still in the works, so check the event website and your email for updates as we finalize the details.

Volunteers Needed

We have had several folks already say they can't wait to help out at the next meeting; however, we are always taking down names as we move ahead and identify areas where we could use a helping hand or two. If you would like to sign up to volunteer for on-site tasks during the Symposium, please contact Susan Oetker at susan.oetker@fws.gov, Becca Winterringer at rwinterringer@trcsolutions.com, or Greg Zimmerman at gzimmerman@enviromscienceinc.com.

Sponsorships

What? You want to give us money so that we can put on a successful Symposium in the black? We won't say No! In fact, we would greatly appreciate your support. We are accepting

donations to be applied to various Symposium expenses, such as helping to cover the costs of the symposium facilities and supplies. Sponsorship levels are the same as they have been in the past:

All Sponsor Contributions Include Recognition in the Symposium Program		
River	≥\$1000	One Complimentary Registration, Logo on Website Registration Page and Symposium Materials
Stream	\$500-\$999	One Registration Reduced by 25%, Logo Displayed at the Welcome Mixer, Logo on Website Registration Page
Eddy	\$100-\$499	Logo on Website Registration Page
Mussel	<\$100	Recognition in the Symposium Program

To make a donation please contact FMCS Treasurer, Emily Robbins [formerly Grossman] at erobbins@ecologicalspecialists.com or fill out the form available on the Symposium page of the website.

Check the event website periodically for Symposium updates:
http://molluskconservation.org/EVENTS/2017Symposium/2017_FMCS-Symposium.html



See you in
Cleveland!

2017 Biennial FMCS Symposium
Cleveland, Ohio -- March 26 – 30, 2017
CALL FOR ABSTRACTS – NOW OPEN

The abstract submission deadline for the 2017 Symposium in Cleveland, Ohio, USA, is **Friday, December 16, 2016**. The Symposium format will include both oral and poster presentations. Oral presentations will be limited to 20 minutes (including the question and answer period). Poster size will be limited to 4 by 4 feet.

Oral and poster presentations concerning freshwater mollusks will be accepted focusing on, but not limited to, the following topics: Life History and Population Ecology, Status of Freshwater Mollusks, Status and Distribution of Freshwater Mollusks, Evolution and Systematics, Physiology and Reproductive Biology, Ecosystems and Community Ecology, Freshwater Mollusk Ecosystem Services, Habitat Restoration, Infrastructure: Impacts and Opportunities, Water Quality, Toxicology, Outreach, Conservation Genetics, Climate Change.

Abstracts for both the posters and the oral presentations are limited to 300 words. Abstract title should appear in all caps and be followed by the author(s) name(s), affiliation(s) and e-mail address(es). Abstracts should be written in Word utilizing Arial 11-point font. The text of the abstract should include clearly stated objectives, a brief description of methods, general results, and the basic conclusion(s). At the bottom of the abstract, please indicate your preference of oral or poster presentation and if you would be willing to switch formats. An example of an abstract from a previous symposium is posted on the event website at: <http://molluskconservation.org/EVENTS/2017Symposium/2017-Abstract-sample.pdf>

Submit your abstract to: 2017fmcssymposium@gmail.com
by **Friday, December 16, 2016**.

Society News

Last Call for 2017 FMCS Officer Nominations

The FMCS is still open for additional nominations for the positions of President-Elect, Secretary, and Treasurer. Each position is for a time period of two years. Any member may nominate themselves or any other member. Nominees must be current FMCS members in good standing and who agree to be nominated. These positions will take effect during the FMCS symposium in Cleveland, Ohio, in March of 2017.

This is a great opportunity for those members seeking to increase their involvement in the FMCS. These positions are critical for the Society to function. The Society will greatly benefit from nominations from a diverse cross-section of the membership. Please consider yourself or another member for these positions. Please send nomination information to Leroy Koch (leroy_koch@fws.gov) by **October 5, 2016**.

The Nominations Committee will select the two candidates for each office who receive the most nominations and are willing to run for that office. We anticipate that position statements from the candidates will be posted in the December 2016 issue of *Ellipsaria*, and on the FMCS website in January 2017. Voting will occur in February 2017 on the FMCS website.

Workshop Topics Still Needed for 2018 !

Heidi Dunn, President Elect

Hi all of you enthusiastic FMCS members. We had another great workshop in 2016. Thanks to all who organized and attended the Genetics Workshop in Shepherdstown, West Virginia. We are currently deciding on what to do in 2018. Topics that have been suggested so far include:

- Sampling protocols, state by state with a panel discussion
- Diseases of freshwater mollusks
- New tools, like genomics, acoustic Doppler current profiler, etc.
- Standardized sampling: are there minimum guidelines?
- Water quality and toxicology

These workshops keep us up to date on the latest mollusk research and are always a lot of fun. If you have a topic you would like to see addressed and/or would like to assist with planning the workshop in 2018, please let me know at HDunn@ecologicalspecialists.com. I look forward to seeing some great ideas.

Announcements

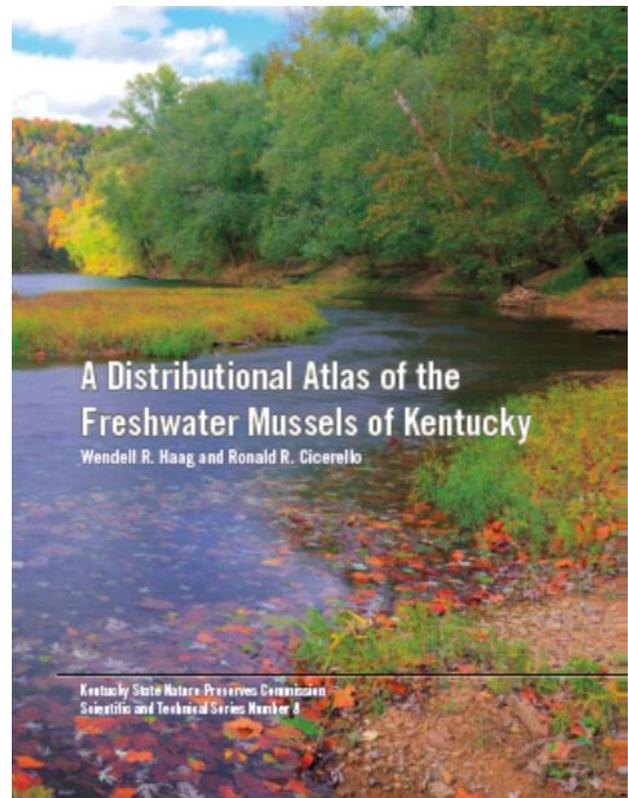
NEW BOOK: A Distributional Atlas of the Freshwater Mussels of Kentucky

Haag, W.R. and R.R. Cicerello. 2016. Scientific and Technical Series 8. Kentucky State Nature Preserves Commission, Frankfort, Kentucky. 299 pp.

The core of this book (200 pages) provides current and historical distributions for all 100 species and subspecies of freshwater mussels recorded from the State of Kentucky. [Identification information and illustrations of the taxa are not included.] It also includes an extensive introductory section (66 pages) that provides a description of river systems and aquatic habitats in Kentucky, a history of mussel studies in the state, an examination of patterns of diversity and biogeography, and a discussion of conservation issues related to Kentucky's mussel fauna.

This book is available free of charge from the Kentucky State Nature Preserves Commission. A downloadable pdf version of the book also is available. For hard copies or to download the pdf, contact KSNPC at:

Kentucky State Nature Preserves Commission
801 Teton Trail
Frankfort, KY 40601-1403
502-573-2886
naturepreserves@ky.gov





New Mural All About Tennessee River Mussels

In early July 2016, the Portland, Oregon-based Center for Biological Diversity (CBD) announced the completion of a 230 foot (70 m) long mural in Knoxville, Tennessee, depicting the life histories of Tennessee River freshwater mussels. This mural is located along the Third Creek Greenway, west of the University of Tennessee campus and just south of Kingston Pike at Tyson Park. The mural was designed and painted by Portland-based artist Roger Peet with help from Merrilee Challis and Tricia Tripp. It is one of eleven murals being developed by CBD to promote community awareness of regional biodiversity and endangered species around the United States.

While rather stylistic in detail, this mural adequately illustrates (and identifies!) the shells of three native mussel species [from left to right: Wavtrayed Lampmussel, *Lampsilis fasciola* (with its mantle lure); Cumberland Combshell, *Ellipsaria brevidens* (with a captured fish), and Pink Mucket, *Lampsilis abrupta*]. The mural also includes two possible fish hosts (Blotchedside Logperch, *Percina burtoni*; and Citico Darter, *Etheostoma sitikuense*), glochidia on fish gills, and juvenile mussels falling into a dense mussel bed.

The completion of this new mural was featured on Page one of the July 7, 2016, issue of the Knoxville News Sentinel and was covered during several local television news programs. CBD also hosted a public celebration for the mural, complete with music, crafts, and refreshments.



-The Tennessee River is home to an amazing diversity of freshwater mussels, many of which are endangered and deserve our protection.
 -mural by Roger Peet, Merrilee Challis, and Trish Tripp.
 -sponsored by the Center for Biological Diversity - biologicaldiversity.org
 @toosphexy thanks to Chris Irwin

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. 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.

Upcoming Meetings

March 26 – 30, 2017 – FMCS 10th Biennial Symposium, Cleveland Downtown Marriott at Key Center, Cleveland, Ohio Theme: ***Ecosystems, Engineering, Valuation, and Practice – The Roles of Freshwater Mollusks in a Changing Environment.***

http://molluskconservation.org/EVENTS/2017Symposium/2017_FMCS-Symposium_INTRO.html

March 26 - 30, 2017 – National Shellfisheries Association 109th Annual Meeting, Knoxville, Tennessee, USA Theme: [not yet posted] <https://shellfish.memberclicks.net/annual-meeting>

June 4 – 9, 2017 – Society for Freshwater Science Annual Meeting, Raleigh, North Carolina, USA Theme: *Designing our Freshwater Futures* <http://sfsannualmeeting.org/>

Summer, 2017 – American Malacological Society 83rd Annual Meeting Dates, Location, and Theme not yet posted <http://www.malacological.org>

August 20 – 24, 2017 – American Fisheries Society 147th Annual Meeting, Tampa, Florida Location, and Theme not yet posted <http://fisheries.org/events-page/future-afs-meetings/>

Spring (?) 2018 – FMCS Workshop, Topic and location yet to be determined.

July (?) 2018 – Society for Conservation Biology North American Sectional Meeting, Toronto, Ontario, Canada Dates, and Theme not yet posted <http://scbnorthamerica.org/naccb2016/>

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.

Match of *Pleurocera gabbiana* (Lea, 1862) to Populations Cryptic Under *P. simplex* (Say, 1825)

Robert T. Dillon, Jr., Department of Biology, College of Charleston,
Charleston, South Carolina 29424 USA dillonr@fwgna.org

In the first note of this series (Dillon 2016), I reported the discovery of two reproductively isolated populations of pleurocerid snails cryptic under the nomen "*Pleurocera simplex* (Say 1825)" in Pistol Creek, Maryville, Tennessee – one demonstrating "fat" shell morphology, and the other "skinny". In a second note, Dillon and Robinson (2016) matched the fat population (S6f) both genetically and morphologically to a sample from the type population of *Pleurocera simplex* collected at Saltville, Virginia (S5). The skinny population (S6s) was matched to population S1, previously sampled by Dillon and Robinson (2007) from Indian Creek in Lee County, Virginia. Here I report a match for populations S6s and S1.

I initially reviewed descriptions, figures, and extant type material for all six nominal synonyms of *P. simplex*: *warderiana*, *subsolida*, *densa*, *vanuxemii*, *prestoniana* and *aterina*. All of these, however, demonstrated the relatively enlarged body whorl characteristic of typical ("fat") *simplex*. I then conducted a more general (and admittedly rather undirected) review of all type material attributed to the genera *Melania*, *Goniobasis*, *Elimia* or *Pleurocera* held in the U.S. National Museum or the Academy of Natural Sciences of Philadelphia. And my eyes happened to fall on USNM 118991, the holotype for *Goniobasis gabbiana* (Lea 1862), shown in Figure 1.

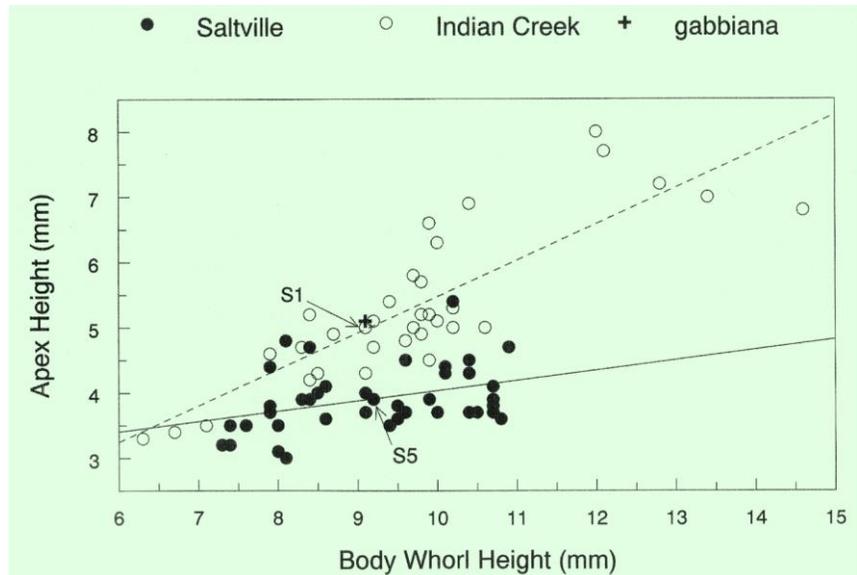
Isaac Lea first published a brief Latinized description of *Goniobasis gabbiana* in his (1862) description of the new genus *Goniobasis*, followed by a more complete (English) description and figure in 1863. His locality data were extremely vague: "Tennessee Prof. G. Troost; Alabama Prof. Tuomey." The species nomen was passed along as valid by Tryon (1873) but was essentially forgotten by Goodrich, who listed it as a "species in doubt" in his 1930 Alabama paper but neglected it entirely in his 1940 review of the Pleuroceridae of the Ohio River drainage system, which covered most of Tennessee. Thus, although still valid, *Goniobasis* (or "*Elimia*") *gabbiana* was not included in the more recent reviews of Burch (1989) and Turgeon et al. (1998). In addition to the holotype, the USNM holds just two lots labeled *Goniobasis gabbiana*, both from the nineteenth-century malacologist A. G. Wetherby, neither matching the type. To my knowledge, no pleurocerid lots are held under the nomen *gabbiana* in any other North American museum.



Figure 1. From left: An exemplar shell from population S1 of Indian Creek, the holotype of *Pleurocera gabbiana* (USNM 119991), and an exemplar shell from topotypic population S5 of *Pleurocera simplex*. The scale bar is marked in mm. A = Apex height, B = Body whorl height.

On Figure 2, the holotype of *P. gabbiana* is plotted by its apex height and body whorl height. The match in relative shell dimensions between USNM 118991 and *Pleurocera* population S1 of Indian Creek would appear to be nearly perfect. The evidence thus suggests that *Pleurocera* populations S1 at Indian Creek and S6s at Pistol Creek may be identified as *Pleurocera gabbiana* (Lea 1862), a nomen here revived after 150 years of obscurity.

Figure 2. Shell apex height (A) as a function of body whorl height (B) in pleurocerid population S1 sampled from Indian Creek, and in topotypic population S5 of *Pleurocera simplex* sampled from Saltville. The exemplar shells illustrated in Figure 1 are noted with arrows. Graphed as a cross is the holotype of *Goniobasis gabbiana* (USNM 118991).



It is interesting to contrast this situation with those described by Dillon and Robinson (2011) for *Pleurocera catenaria* (Say 1822), Dillon (2011) for *P. clavaeformis* (Lea 1841), Dillon et al. (2013) for *P. canaliculata* (Say 1821), and Dillon (2014) for *P. semicarinata* (Say 1829). Intraspecific shell variation is so extreme in all four of those cases that nineteenth-century taxonomists recognized multiple nominal species, and even multiple genera, within single conspecific populations. Here, we document the opposite situation, where interspecific shell variation is so slight that twentieth-century taxonomists have not distinguished any differences.

Our subsequent field surveys have uncovered 58 additional populations apparently referable to *P. gabbiana* -- often mixed with typical *P. simplex* -- locally abundant in small streams of the Tennessee River drainage from the vicinity of St. Paul, Virginia, southwest perhaps 100 km to Madisonville, Tennessee (Dillon and Kohl 2013). As we mount expeditions to catalog the rich biodiversity yet lying undiscovered in the most remote corners of the earth, we might profitably pause to examine the less exotic but equally valuable biodiversity we have too often overlooked in our own backyards.

References:

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***Ligumia subrostrata* Glochidia Metamorphose on Centrarchids and Other Fish Species**

**Mark Hove¹, Kelli Burstein², Mike Davis², Shelby Marr², Madeline Pletta²,
Jaisa Williams², Tricia Wagner², and Bernard Sietman²**

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² Minnesota Department of Natural Resources (DNR), Lake City, Minnesota 55041

Ligumia subrostrata (Say, 1831) has a widespread distribution in central and southern United States; however, its distribution has decreased in the upper Midwest, and the Big Sioux River drainage of the Missouri River basin appears to be a remaining stronghold for this species in the northern portion of its range (Sietman *et al.*, 2003). In Minnesota, it is currently found only in creeks and headwaters of the Big Sioux – Rock River system in the southwestern corner of the state (Sietman *et al.*, 2003, Minnesota DNR, unpublished data). *Ligumia subrostrata* was listed as a state threatened species in 2013 (Minnesota DNR 2013).

Previous studies describing *L. subrostrata* host relationships were insightful but limited in scope. *Ambloplites rupestris*, *Lepomis cyanellus*, *L. humilis*, *L. macrochirus*, *Micropterus salmoides*, *Pomoxis*, and *Perca flavescens* were listed as suitable Lampsiline hosts, including *L. subrostrata*, but trial details were not provided (Lefevre and Curtis 1910). *Lepomis cyanellus*, *L. gulosus*, and *L. macrochirus* were observed naturally infested with *L. subrostrata* glochidia (Lefevre and Curtis 1912, Stern and Felder 1978). In a pond experiment, Haag and Stoeckel (2015) reported successful natural recruitment of *L. subrostrata* using stocked *Lepomis macrochirus*.

Standard glochidia host suitability trials were conducted to better understand the life history needs of this species, and to facilitate juvenile propagation for reintroduction efforts (Johnson *et al.*, 2012). Fishes were grouped by species in aquaria and held between 20-23 °C. Gravid *L. subrostrata* were collected from Rock River, Pipestone County, Minnesota, on June 23, 2016.

Several centrarchids and a variety of other fishes served as suitable hosts for *L. subrostrata* glochidia (Table 1). Our observations of glochidia metamorphosing on centrarchids were consistent with previous work. In the future, we plan to retest species where few juveniles were recovered, as well as other fish species.

Associated with this study, some specimens of *Lepomis humilus* and *L. macrochirus* collected from the Rock River released naturally infested juvenile mussels. We plan to identify those juvenile mussels this fall.

Table 1. Results from *Ligumia subrostrata* glochidia host suitability trials. No. of fish = number of surviving fish (some mortality occurred during trials), No. of juveniles = number of juveniles released, Period (d) = juvenile release period in days.

Fish Species (Trial No.)	No. of fish	No. of juveniles	Metamorphosis Success (%)	Period (d)
<i>Amia calva</i>	2	2	0.25	23
<i>Ictiobus cyprinellus</i>	1	2	0.06	23
<i>Noturus gyrinus</i>	11	1	0.2	21
<i>Umbra limi</i>	10	244	57	16-28
<i>Fundulus diaphanus</i>	1	10	10	20
<i>Culaea inconstans</i>	12	174	77	16-25
<i>Ambloplites rupestris</i> (1)	3	884	40	16-27
<i>Ambloplites rupestris</i> (2)	1	0	0	
<i>Lepomis cyanellus</i> (1)	1	170	76	21-28
<i>Lepomis cyanellus</i> (2)	1	277	59	16-34
<i>L. gibbosus</i>	1	10	53	16-28
<i>L. macrochirus</i>	1	20	69	21-25
<i>Pomoxis nigromaculatus</i>	1	16	52	21-25

Species that were not suitable hosts (number of trials, number inoculated): *Clinostomus elongatus* (1, 2), *Cyprinella spiloptera* (1, 2), *Luxilus cornutus* (1, 6), *Margariscus nachtriebi* (1, 3), *Nocomis biguttatus* (2, 6), *Notropis hudsonius* (1, 5), *Ictalurus punctatus* (1, 2), *Cottus bairdii* (1, 1), *Perca flavescens* (1, 4), *Percina caprodes* (1, 2), *Percina maculata* (1, 4)

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**Additional Information Concerning the Conquest of Europe by the
Invasive Chinese Pond Mussel *Sinanodonta woodiana*, 43.
News from Austria, Bulgaria, Italy, Poland, and Spain**

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Here again is some information concerning various studies dealing with the invasive Chinese Pond mussel in Europe. This time, the information comes from Austria, Bulgaria, Italy, Poland, and Spain.

Austria

Billinger (2016) reported briefly about the establishment of the Chinese Pond mussel in the Lower Inn near Braunau am Inn.

Bulgaria

In two articles, Yancheva *et al.* (2016a, b) are dealing with the effect of Cadmium, on the lysosomal membrane stability and respiration rate of two mussel species (*Sinanodonta woodiana* and *Dreissena polymorpha*). Increase of Cadmium resulted in a significant decrease in the lysosomal destabilization indices with lower retention time and an increase of the respiration rate index.

Italy

Marrone and Naselli-Flores (2015) listed *Sinanodonta woodiana* as an allochthonous species present in Sicilian waters.

Poland

Cichy *et al.* (2016) investigated the presence of symbiont fauna elements on and in 340 Chinese Pond mussels collected in thermally heated lakes and in fish ponds with a natural thermal regime. Their study revealed the presence of *Rhipidocotyle campanula*, *Unionicola ypsilon*, *Chaetogaster limnaei* and *Glyptotendipes* species, all symbionts known to occur on native freshwater mussels. Some symbionts turned up in higher numbers on mussels collected from heated waters, while other species preferred mussels collected from waters with a more natural thermal regime.

Spain

A decision has been made to clean the waters of the "Parc Natural del Montgri, les Medes & el Baix Ter" of Chinese Pond mussels (Anonymous, 2016). A photograph illustrating the message shows three persons of the "Fundació Onyar-La Selva" wading in a canal and trying to collect manually the invasive mussels present in the National Park! [Remark: But what about the fish infected with the glochidia of *Sinanodonta woodiana*?]

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The Invasive Black Striped Mussel *Mytilopsis sallei* is Still Thriving in the Brackish Part of the Lower Qishon River in Israel

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The Black Striped mussel *Mytilopsis sallei* (Récluz, 1849), Family Dreissenidae, is one of the eight mainly brackish water species belonging to the genus *Mytilopsis* Conrad 1857 (Huber, 2010). Originally, it was described from the Rio Dulce in Guatemala (Récluz, 1849 & 1852), but seems to occur in a natural way also in rivers elsewhere along the east coast of Central America, like Panama, Costa Rica, and Belize.

Since harbors are often situated near the estuaries of rivers and these mussels attach themselves by means of their byssus to the hulls of vessels, this species has been transported in the last 30 years to many harbors especially in the Indo-Pacific.

It also is known from the Eastern Mediterranean. The first record of *Mytilopsis sallei* from that part of the Mediterranean is an odd one and dates back to 30 November 1989, when a loose, but perfectly preserved valve was found at a depth of 1400 m (!) 43 km west of Nahariyya, Israel (Mienis, 2009). Although this record was published with a delay of 20 years, we knew from the beginning that we had to look for living colonies of that invasive species somewhere in the Levant.

In October 2002, Leon Hoffman and Bart van Heugten, two malacologists from the Netherlands, succeeded in locating the first living colony of it in the estuary of the Nile River in Egypt near Ras al Barr, Dumyat (Hoffman *et al.*, 2006). This find was followed on 5 February 2008, by another odd one: numerous specimens were discovered adhered to the hull of the "Shikmona," the research vessel of the Israel Oceanographic and Limnological Research Institute when it was dry-docked in Haifa (Galil & Bogi, 2008). All of the specimens were concentrated on parts of the hull which had not been treated with an antifouling agent. The question remained unsolved where this research vessel had picked up these mussels.

During an ecological survey of the Qishon River near Haifa on 19 May 2014, Dr. Eldad Elron and Mr. Zohar Yanai discovered a colony of the Black Striped mussel near the Irish Bridge, more or less the most eastern part of the Qishon River which is still influenced by the tidal regimes in the Eastern Mediterranean



Three color morphs of *Mytilopsis sallei* from the Qishon River, Israel. Photograph by Oz Rittner.

(Elron & Yanai, 2014; Mienis, 2014). The presence of this mussel species near the Irish Bridge was confirmed by Mr. Liron Goren on 26 June 2014 (Goren, 2014). Part of his material was used for a DNA-analysis carried out by Dr. Tamar Feldstein (Tel Aviv University). The results agreed with those obtained from *Mytilopsis sallei* collected in India and the Far East (Wong *et al.*, 2011). Unfortunately the DNA of specimens collected in the area of its natural distribution in Central America is still unknown.

The presence of the Black Striped mussel in the brackish lower part of the Qishon River was recently confirmed by Dr. Eldad Elron. On 9 May 2016, he found specimens adhered to stones on the bank of the river near the HaHistadrut Bridge and, on 28 June 2016, specimens were also encountered by him in an aquarium used for monitoring the water quality of the river near the HaHistadrut Bridge.

The presence of these mussels in the part of the Qishon River influenced by the tidal regime of the Eastern Mediterranean forms a rather disturbing situation. Vessels moored in the estuary of the river may be infested by these mussels and in this way mussels can be easily transferred to estuaries of other Mediterranean rivers in Israel.

Acknowledgements

I like to thank Mr. Henk Dekker, Dr. Bella S. Galil, Dr. Eldad Elron, mr. Zohar Yanai, and Mr. Liron Goren for permanently lodging part of the discussed material in the Mollusc Collection of the Steinhardt Museum of Natural History (SMNH MO) at the Tel Aviv University. Likewise I like to thank my colleague Oz Rittner for his excellent photograph.

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Downstream Progress of the Invader Asiatic Golden Mussel *Limnoperna fortunei* (Dunker, 1857) in the Upper Uruguay River Basin section of Santa Catarina State/ SC, Central Southern Brazil region, and New Additions to State Inventory of Native Freshwater Bivalve Species

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In 2012, the occurrence of the Asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857), the only freshwater/ limnic representative known of the family Mytilidae (an invasive introduced species), was confirmed for first time in Santa Catarina's State/ SC and the Upper Uruguay River Basin, central southern Brazil (Agudo-Padrón & Porto Filho, 2013). Since then, we have been monitoring the advancement of the species downstream in this basin, on the fluvial shore of the Santa Catarina's State.

On 28/07/2016, a local professional biologist contacted us requesting the possible identification of a small limnic bivalve mollusk illustrated in two field photographs (Figure 1). This bivalve was found in dense colonies on the installations of the Pequena Central Hidrelétrica – PCH Rio Bonito (Bonito River Small Hydroelectric Power Plant) on the Irani River, a tributary of the Upper Uruguay River Basin located between the regional Municipalities of Chapecó and Arvoredo (Figure 1). The species was immediately confirmed by us as a typical Asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857), confirming our expressed forecasts for the region (Agudo-Padrón and Porto Filho 2013).



Figure 1. Isolated specimen of Asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857) found in the installations of the Bonito River Small Hydroelectric Power Plant, geographically located between the Municipalities of Chapecó (Map – red color) and Arvoredo (Map – green dot), Upper Uruguay River Basin in western Santa Catarina State/ SC.

Two years before, on 14/02/2014, limnologist geographer research Érico Porto Filho (Socioambiental, Florianópolis/ SC, Pers. com), reported (sic): "...the Asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857), terrible freshwater bivalve exotic invader, already dispersed, as expected ... (see Agudo-Padrón and Porto-Filho, 2013) ..., down the river with a high density in the basin of the Upper Rio Uruguay. With the strong summer drought that crosses the south of Brazil at this time extensive decreased areas ... (see Figure 2) ... in the river channel and dams of the great hydropower plants ... (Usinas Hidrelétricas – PCHs)" ... of Machadinho and Itá, many mollusk banks were exposure, with (sic) " ... massive mortality and smelly ... " ... (see Agudo-Padrón 2008:88) ..., all of which was highlighted object in the local media (... which we reproduce to next !):

"... The report of the local Rural Radio (Concordia, city and Municipal District/ SC) received in recent days, a number of complaints from people who live or pass close to the lake of the Uruguay River. According to reports, there is a strong smell being vented in the place. Those who watched more closely, may notice that there is a kind of snail stuck on the banks stones. The problem accumulates across the length of the lake. The situation is complicated for the local trade: ... located near the region is already losing customers.

Thus, the reportage of Rural Radio contacted experts to try to understand the problem. According to Diego Collet, the Director of Tractebel, the company that manages the Itá Hydroelectric Power Plant, it is a golden mussel. The case is being monitored and observed in several rivers and lakes of the country. Between yesterday and today, according to people near the lake, the stench decreases due to the drop in temperatures and to the rain, but it still exists....".



Figure 2. High density of Asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857) in the lake of the Hydroelectric Power Plant of Itá, Upper Uruguay River Basin, SC, (year 2014, strong summer drought), with smelly massive mortality.

And while all this happens in the central southern region of the country, other important Brazilian major river basins also continue to be affected by this irrepressible exotic invasive species (Barbosa *et al.* 2016).

Additionally, during the writing of this report, another “cryptic regional work” of academic nature was also rescued (Ulrich 2011), adding the following three species of little native freshwater bivalves (pea clams, Sphaeriidae) for the State: *Sphaerium cambaraense* (Mansur, Meier-Brook e Ituarte, 2008), *Pisidium aff. vile* (Pilsbry, 1987) and *Pisidium aff. dorbignyi* (Clessin, 1879). These additions raise to 1012 (33 of which are freshwater bivalves) the total number of known continental and marine mollusk species occurring in Santa Catarina State/ SC (Agudo-Padrón 2016:30) (Table 1).

Finally, reporting for this microbasin (Irani River, tributary of the great Uruguay River), the following limnic bivalve species (Ulrich 2011: 43): the native naiads Mycetopodidae *Anodontites tenebricosus* (Lea, 1834) and Hyriidae *Diplodon* sp., the little pea clams Sphaeriidae *Pisidium* sp. and *Eupera* sp. and, finally, the exotic invasive Asian clam *Corbicula largillierti* (Philippi, 1844) (Figure 3), this last very abundant in the searched region.



Figure 3.- Native mussel/ naiads *Anodontites tenebricosus* (Lea, 1834) (left) and exotic invasive Asian clams *Corbicula largillierti* (Philippi, 1844) (center and right), this last a very abundant species in the Bonito River Small Hydroelectric Power Plant lake and the Irani River microbasin region, Upper Uruguay River Basin, Western Santa Catarina State/ SC.

Table 1. Updated register of the mollusk species occurring in the State of Santa Catarina/ SC, Brazilian Central Southern region, as of August 2016.

Mollusk Groups	Species	Genera	Families
Freshwater Bivalves	33*	11	5
Freshwater Gastropods	40	19	8
Terrestrial Gastropods	154	68	22
Marine/ Estuarine Species	785	422	165
Totals	1012	520	200

* Including the little native pea clams Sphaeriidae *Sphaerium cambaraense* (Mansur, Meier-Brook e Ituarte, 2008) – species previously reported for the highlands of the neighboring State of Rio Grande do Sul/ RS (Agudo-Padrón, 2012), *Pisidium aff. vile* (Pilsbry, 1987) and *Pisidium aff. dorbignyi* (Clessin, 1879).

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Ocurrence of Limnic/ Freshwater Mollusks in the North Region (Iguaçu River Basin) of Santa Catarina State/ SC, Central Southern Brazil: A Preliminary Report

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Considering the history of the continental mollusc research conducted by us in the geographical territory of the State of Santa Catarina/ SC during the last twenty years, traditionally the malacological North region (see Agudo-Padrón 2016:30-Figure 2), more specifically the “Iguaçu River Basin” section (Figure 1), it presents today as the most poorly studied.

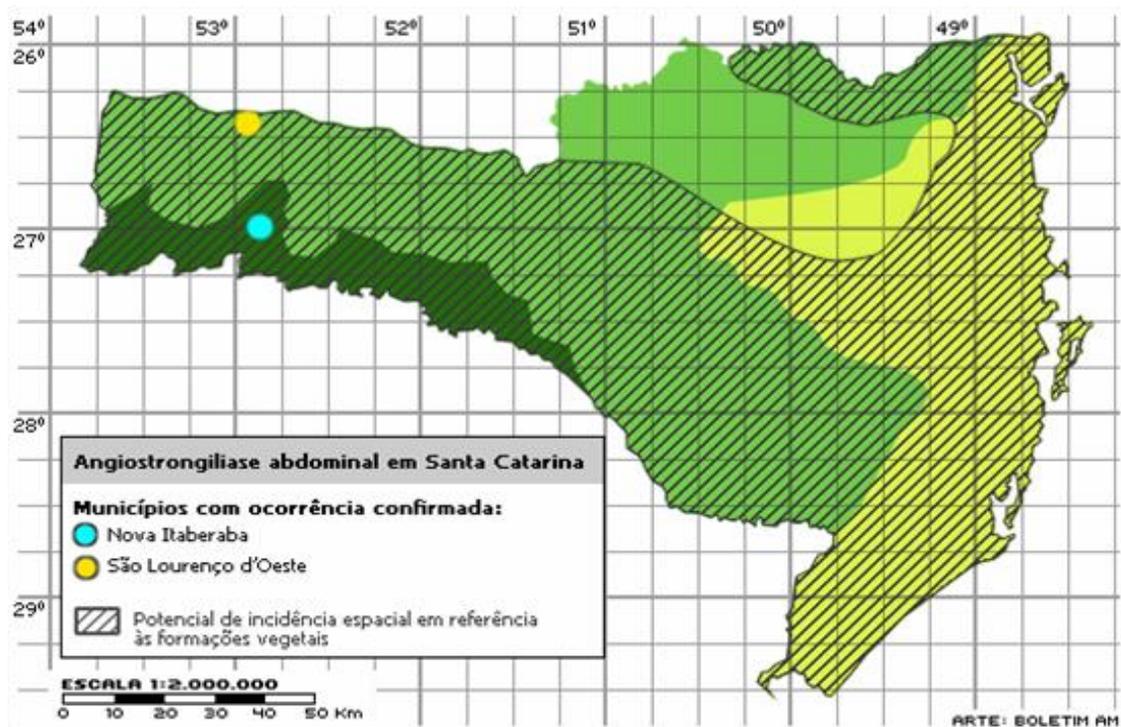
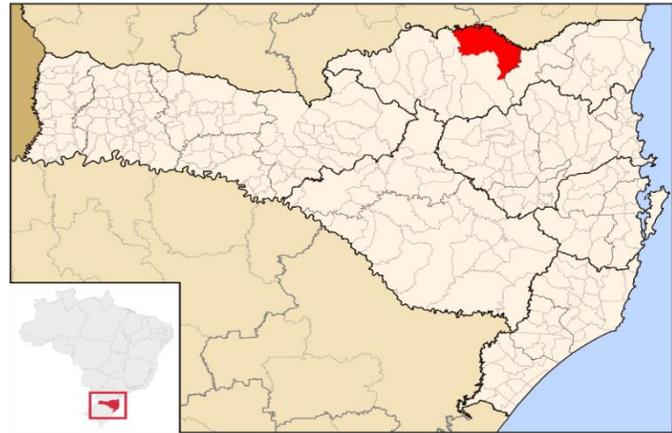


Figure 1. Spatial localization (upper border - area not shaded) of the Iguazu River Basin in the State of Santa Catarina/ SC (the general area not shaded, including the neighboring border space immediately adjacent to right, reflects the "lack of information" sites). Font map: Agudo-Padrón *et al.* 2013:85-Figure 39.

Aiming to overcome this situation, recently some confirmations in the field were obtained in the region, specifically in the Municipality of Mafra (26°06'39"S; 49°48'18"W), at an altitude of 793 meters, 310 km from the capital Florianópolis, and 105 km from Curitiba, capital of the neighboring State of Parana/ PR (Figure 2). Mafra is located fully in the Iguazu hydrographic basin. The main river of the municipality is the Rio Negro (Black River), on the border of Santa Catarina/ SC and Paraná/ PR. Another important river that flows into the Black River is the Rio da Lança (Lance River), the largest river entirely Mafrense.

Figure 2. Localization of the Mafra Municipal District (red color) in the geographical territory of Santa Catarina State/ SC.



During this field work, we have confirmed the presence of three limnic/ freshwater species in this basin: native freshwater snail Hydrobiidae, *Littoridina piscium* (d'Orbigny, 1835) (Figure 3); native limnic/ freshwater pearl mussel/ naiad Hyriidae *Diplodon* cf. *expansus* (Küster, 1856) (Figure 4); and exotic invasive Asian clam Corbiculidae *Corbicula largillierti* (Philippi, 1844) (Figure 5).

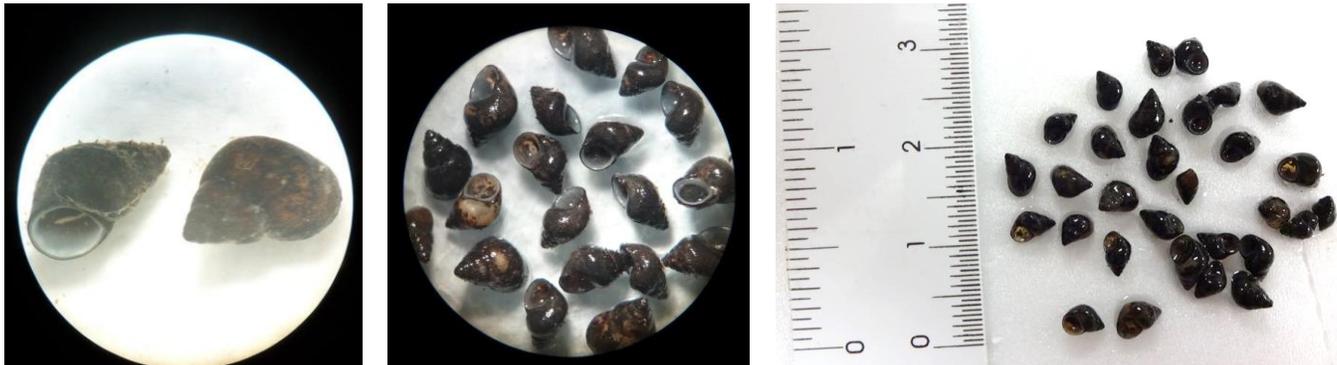


Figure 3.- Native limnic/ freshwater snail Hydrobiidae *Littoridina piscium* (d'Orbigny, 1835). Rio da Lança (Lance River), tributary of the Negro River in the basin of the same name, Mafra Municipal District, Santa Catarina State/ SC. Date: Feb 02 to March 01 2016. Credit photos: Biol. Anã Marta Schafaschek, Mafra/ SC

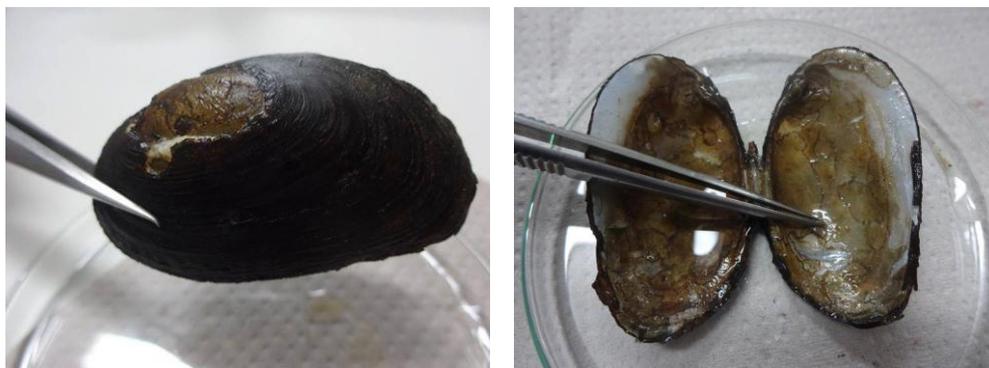


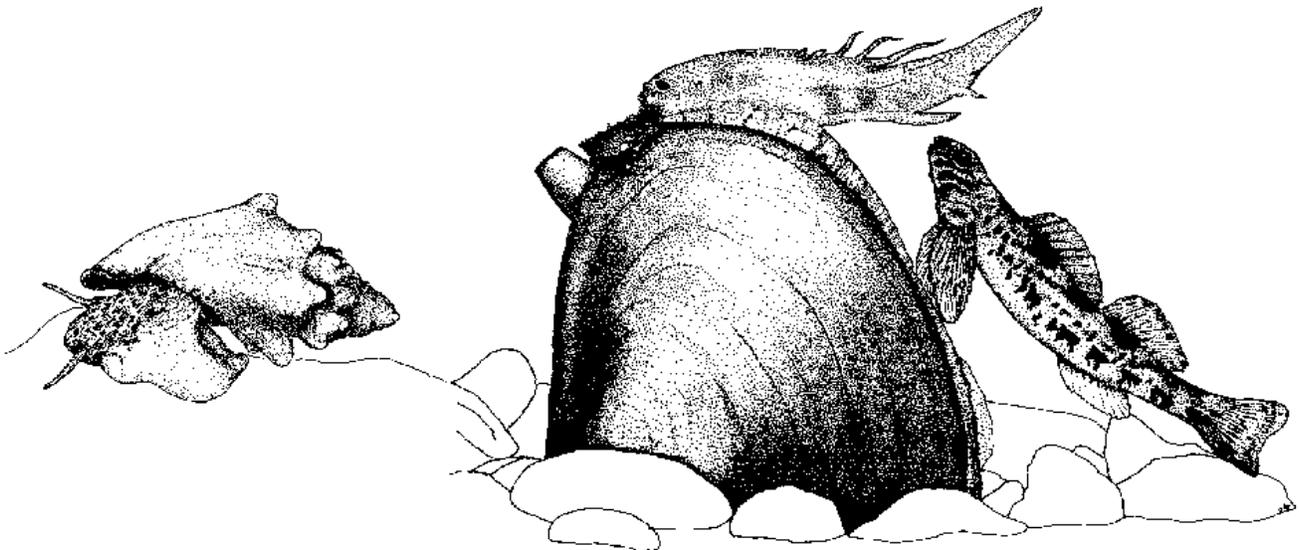
Figure 4. Native limnic/ freshwater pearl mussel/ naiad Hyriidae *Diplodon* cf. *expansus* (Küster, 1856). Rio da Lança (Lance River), tributary of the Negro River in the basin of the same name, Mafra Municipal District, Santa Catarina State/ SC. Date: May 20 2016. Credit photos: Biol. Anã Marta Schafaschek, Mafra/ SC.

Figure 5. Exotic invasive Asian clam *Corbiculidae* *Corbicula largillierti* (Philippi, 1844). Rio da Lança (Lance River), tributary of the Negro River in the basin of the same name, Mafra Municipal District, Santa Catarina State/ SC. Date: March 18 2016. Credit photo: Biol. Anã Marta Schafaschek, Mafra/ SC



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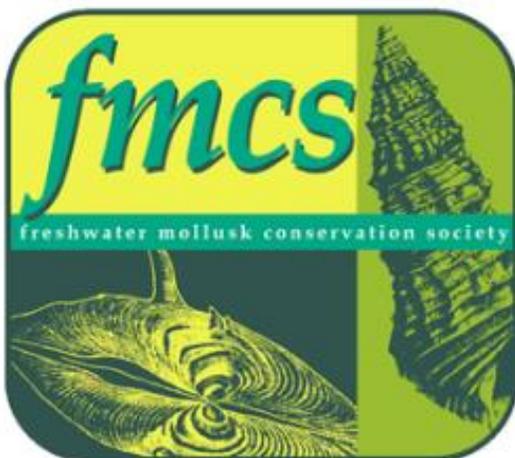
Symposium

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Parting Shot



At times during the Summer months, the 13-mile (21-km) reach of the Clinch River downstream from Norris Dam in Anderson County, Tennessee, looks like a river of smoke. The cold water discharge from the dam cools the humid air enough so that fog forms just above the water surface. While this part of the river retains its natural bedrock and gravel substrate, the discharge water is too cold to support most native fishes or freshwater mollusks. Only rarely now does some trout fisherman find a survivor of the 40+ freshwater mussel species that existed here before the dam was closed in 1936 -- 80 years ago. Photograph by John Jenkinson.



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.