



**Newsletter of the Freshwater Mollusk Conservation Society**  
**Volume 16 – Number 1** **March 2014**

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**The Work of Our Society**

Patricia Morrison, President

***The REAL work of our Society  
is what you do, each and every day.***

The work of the FMCS is not only the occasional meetings and workshops and symposia that we hold, but also your hard work and dedication in your everyday life as you study, undertake research, write, speak in public forums, and manage the conservation of freshwater mollusks on the ground (and in the water).

I thought this might be a good time to bring you up to date on some of the work going on “behind the scenes” by our Society.

**Projects Funded:** The Board has provided funding for two exciting projects that will advance the state of knowledge of mussels and their distribution:

- a “Mussel App” that is being developed and tested for smartphones; and
- the North American Freshwater Mussel Atlas was given a boost to begin uploading and managing data online.

Our Society also provides monetary support for Regional Mollusk group meetings. The Board will be formulating a plan to set aside a certain amount of money each year to fund other worthwhile projects that the committees bring forward – a great new step for our Society.

**Committees:** Our 11 Standing and two ad hoc committees are the real “work horses” of our organization. The chairs and members of these groups

are advancing new projects and creating a permanent record of the functions of the various components of the Society. Here is what they are working on:

- We have a task force developing a **Policy and Procedures Manual** to document the jobs, tasks, and responsibilities of the various offices and committees.
- The **Propagation Committee** is developing and “test driving” new databases to record propagations, stockings, and relocations of freshwater mollusks.
- The **Environmental Quality and Affairs Committee** submitted official comments on proposed species listings and projects which may harm mollusks.
- **Guidelines and Techniques Committee** members are compiling state mussel survey protocols, and will help guide needed revisions to the publication “Investigation and Monetary Values of Fish and Freshwater Mussel Kills.”
- The **Outreach Committee** is updating the FMCS website, and putting the finishing touches on a new brochure.
- Our **Symposium Committee** is always ahead of the game, planning our 2014 workshop and 2015 symposium.
- Who doesn’t love the work of the **Awards Committee**? They recognize and celebrate the contributions of long standing professionals in our field of science, hand out money to students so they can come to our meetings, and support the gatherings of Regional Mollusk groups.
- The **Genetics Committee** will be hosting a “hands on” workshop in 2016.
- If you check out the **Gastropod Status and Distribution Committee** link, you’ll see the 2012 AFS accepted list of names and status of freshwater gastropods from Canada and the United States.
- The **Information Exchange Committee** folks faithfully bring you *Walkerana* (Volume 16, No. 2 was published online this past September) and *Ellipsaria* (posted four times per year).
- The **Mussel Status and Distribution Committee** has the Mussel Atlas and App in development, and also is going to maintain the accepted list of scientific and common names of mussels on their part of our website.
- The **Nominations Committee** is always searching for good candidates for officers to help lead us into the future.
- The ad hoc committee on the **National Strategy for the Conservation of Native Freshwater Mollusks** continues to move forward towards publication of the revised National Strategy, with a large cadre of volunteers helping to flesh out the text of the manuscript. You all played a large part in formulating the new issues and goals you will see in the document.

**Future Initiatives?** These will come from **YOU**. We need to change and adapt to meet the challenges of the times. What do you see the Society becoming in the future? What tools do we need to develop and use? How do we stay relevant? I encourage you to get involved in what our Society is doing. Join a committee, submit manuscripts to our journal and newsletter, and consider serving as an officer.

## Society News

### Dam Removal Workshop is Next Month

The 2014 FMCS Workshop *Mussel Studies and Regulatory Processes Associated with Dam Removal Projects* will be held on Thursday and Friday, **April 24 & 25, 2014**, in Portland, Maine. To register please go to: [http://molluskconservation.org/2014Workshop/2014\\_FMCS-Workshop.html](http://molluskconservation.org/2014Workshop/2014_FMCS-Workshop.html). **Early registration closes on March 3!** Late registration continues until April 7 but will cost you more!

This workshop will be held at the Holiday Inn by the Bay in Portland, Maine. Located 3 miles west of the Portland International Airport, the Holiday Inn by the Bay provides free shuttle service to/from airport, train and bus station for guests and free parking for guests, and free wireless. The Holiday Inn is located in downtown Portland, within walking distance of shops, restaurants, pubs, the Arts District, and the working waterfront. Portland is a safe, culturally fascinating city, and is highly renowned for its restaurants and micro-breweries. A block of rooms has been reserved at a special rate of \$112.00 so be sure to specify the FMCS workshop. You can reserve your room online at: <http://www.innbythebay.com> or by phone at: 1-207-775-2311.



The entire first day of this workshop (Thursday, April 24<sup>th</sup>) will be devoted to invited speakers presenting findings of field studies conducted pre- and post-dam removal from projects in various regions of the country. Speakers will share their experiences and lessons learned, in particular where freshwater mussel studies were conducted; however, these studies also include other environmental variables that may affect aquatic habitat and thus the restoration capacity for mollusks. Speakers will provide recommendations for others currently dealing with active or potential dam removal or refurbishing projects. A panel discussion will occur at the end of this session.

On Friday morning (April 25<sup>th</sup>), the workshop focus will shift to state and federal regulatory processes involved in dam removals. Some states have developed regulatory processes specific to dam removals, or have guidelines on both pre- and post- dam removal environmental studies, including mussel studies. This session also will conclude with a panel discussion. You can get a preview of the confirmed speakers and topics included in this workshop at the event website: <http://molluskconservation.org/Events.html>.

On Thursday evening, plan to join us for hors d'oeuvres and cocktails at the welcome reception and poster presentation. The poster presentations will include the following topics: Habitat and Conservation, Range-wide Status and Distribution, Life History and Ecology, Evolution and Phylogenetics, Outreach and Education, Propagation and Reproduction, Recovery, Contaminants and Water Quality. [**Note:** *The poster abstract deadline has been extended to March 15, 2014. Instructions for authors can be found at: <http://molluskconservation.org/2014Workshop/PDFs/FMCS%202014%20Second%20CallABSTRACTS.pdf>.*] Guest invitations for the reception and poster session, including 2 drink tickets, are available for an additional \$25.00.

Two optional events are offered on Friday afternoon: a site visit to the Penobscot River where two mainstem hydropower dams were recently removed, and a hands-on northeastern mussel species identification workshop.

*TOUR OF DAM REMOVAL SITES ON THE PENOBSCOT RIVER*

Two mainstem hydroelectric dams were decommissioned and removed from the lower Penobscot River in the past two years. This site visit consists of a bus trip to the sites of the Great Works (2012) and Veazie (2013) dams near Bangor, Maine. For comparison, the tour also includes a view of a similar existing hydropower project just upstream of these former dams. These were all typical mainstem, low head, run-of-river hydro projects. The former impoundments provided excellent habitat for mussels, including two state-listed mussel species. The widely acclaimed and innovative restoration project included an intensive mussel salvage effort by a network of volunteers. The trip will include a box lunch with drink. Space is limited!

*MUSSEL IDENTIFICATION WORKSHOP*

Arthur Bogan, Research Curator of Aquatic Invertebrates at the North Carolina State Museum of Natural Sciences will teach a mussel identification workshop focused on northeastern species. The first portion of the workshop will examine the conservation issues facing freshwater mussels, from a worldwide perspective, and will discuss the biology, life history, and distribution of freshwater mussels. The second portion will focus on taxonomic identification, providing methods as well as some examples of freshwater mussels found throughout the northeastern Atlantic Slope of the United States. A key to the native freshwater mussels of the northern Atlantic Slope mussels will be provided. Participants may bring their own voucher specimens to examine. Lunch is included. Space is limited to 25 people.



Please consider becoming a sponsor of this year's Workshop! All Sponsor contributions include recognition in the Workshop program. Sponsorship levels and our thanks to you are:

- River >\$1000 -- One Complimentary Registration, Logo on Website Registration Page, Logo Displayed at the Welcome Social
- Stream \$500-\$1000 -- One Registration Reduced by 25%, Logo Displayed at the Welcome Mixer, Logo on Website Registration Page
- Eddy \$100-\$499 -- Logo on Website Registration Page, Logo Displayed at one Breakfast or Break Session
- Mussel <\$100 -- Recognition in the Workshop Program

The sponsorship form is available online at:

[http://molluskconservation.org/2014Workshop/2014\\_FMCS-Workshop\\_SPONSOR.html](http://molluskconservation.org/2014Workshop/2014_FMCS-Workshop_SPONSOR.html).

Payment methods accepted are Visa, MasterCard, and check. Please make checks payable to FMCS and mail to: Debra Descoteaux, FMCS Workshop Planning Committee, HDR Engineering, Inc., 970 Baxter Blvd., Portland, ME 04103. Questions regarding sponsorships can be sent to Mary McCann ([mary.mccann@hdrinc.com](mailto:mary.mccann@hdrinc.com)) or Rebecca Winterringer ([beccawint@yahoo.com](mailto:beccawint@yahoo.com)).

*See you in Portland !*

## Save The Date !!

Plans are well underway for the **FMCS 9<sup>th</sup> Biennial Symposium**, which will be held in St. Charles, Missouri, **March 22-27, 2015**, at the St. Charles Convention Center (<http://www.stcharlesconventioncenter.com/>). This will be a joint meeting with the Upper Mississippi River Conservation Committee (UMRCC), the 71<sup>st</sup> annual meeting of that group. Some may remember that the UMRCC sponsored symposia in 1992 and 1995 in St. Louis to examine the status, conservation, and management needs of freshwater mussels which, ultimately, resulted in the formation of our Society. Now, 20 years later, we will hold a joint meeting to recognize conservation successes and explore future opportunities.

In addition to the usual paper and poster sessions, we will be offering a one-day propagation workshop, and a joint plenary session with the UMRCC focusing on the history and future of the organizations, and sessions on big river and landscape ecology. The mixers, auction, and banquets will also be joint affairs, offering multiple opportunities to network between members.

Although registration rates have not yet been finalized, we expect them to be slightly less than at previous symposia. Here are potential rates to use for budgeting purposes: UMRCC full registration - \$200; FMCS full registration - \$350; combined registration \$425. Some meals will be included in the registration fee. The meetings will overlap one day with a combined plenary and evening social. Hotel rooms at the Embassy Suites attached to the convention center (<http://embassysuites3.hilton.com/en/hotels/missouri/embassy-suites-st-louis-st-charles-hotel-and-spa-STLEMES/index.html>) are expected to be approximately \$118/night for 1-2 and \$128/night for 3-4 people.

For more information about the March 22-27, 2015 Joint FMCS/UMRCC meeting, contact the Local Committee co-chairs: Steve McMurray ([Stephen.McMurray@mdc.mo.gov](mailto:Stephen.McMurray@mdc.mo.gov)) and Heidi Dunn ([hdunn@ecologicalspecialists.com](mailto:hdunn@ecologicalspecialists.com)).

## Announcement

### Now There are Three Mussel-related Courses Being Offered at NCTC

Three courses focused on North American freshwater mussels will be taught at the U.S. Fish and Wildlife Service National Conservation Training Center (NCTC) in Shepherdstown, West Virginia, during 2014. These courses are:

#### **Conservation Biology of Freshwater Mussels CSP 1101**

**Course Length:** 4.5 days    **Dates:** June 16 – June 20, 2014

This is an introductory course on the biology and ecology of freshwater mussels and the conservation issues facing this highly endangered group of animals. Topics to be covered include anatomy, physiology, life history, health, ecosystem services, mussels as biomonitors, conservation status, population impacts, conservation measures (relocation, propagation, conservation genetics), legal issues (permits and the ESA, Section 7 consultations, critical habitat) and field techniques (survey techniques, sampling techniques, habitat assessment). This course will address key characters for identification of freshwater mussels and will provide opportunities in the laboratory to practice with dichotomous keys, however due to time constraints and the regional nature of mussel assemblages; this is NOT a mussel identification course.

**Instructors:** Dr. Chris Barnhart and Heidi Dunn.    **College Credit:** 2 semester hours.

**Freshwater Mussel Propagation for Restoration CSP 1102****Course Length:** 5 days **Dates:** September 8 – September 12, 2014

This is an introductory course designed to explore all culture activities associated with freshwater mussels. Participants will explore the latest culture techniques as they follow freshwater mussels through their entire life cycle in a culture facility, from the collection of gravid females to stocking cultured juvenile freshwater mussels. Following a basic introduction on mussel biology and the goals of mussel propagation, the course will cover the basics of building a culture facility, collecting and maintaining brood stock, collecting host species, infesting host species with larval mussels, collecting and culturing juvenile mussels, and releasing juveniles to the wild. **College Credit:** 2 semester hours.

**Freshwater Mussel Identification for Law Enforcement****Course Length:** 5 days **Dates:** September 22 – September 26, 2014

This course is currently under development. The plan is to help border patrol officers identify freshwater mussels moving in and out of the country illegally. This course is not yet listed in DOI Learn, but stay tuned for more information. **College Credit:** 2 semester hours.

**Tuition:**

Tuition for FWS, NPS, and BLM employees is prepaid. Tuition for participants from other agencies and organizations is \$1,195.00 for each course.

**To Register:**

**DOI employees:** Log In to DOI Learn, enter the course title in the search box, click scheduled classes, and click submit request.

**Non-DOI employees:** For application instructions, contact Marilyn Williams, 304/876-7940 [marilyn\\_williams@fws.gov](mailto:marilyn_williams@fws.gov)

For more information about any of these courses, contact Matthew Patterson, 304/876-7473 [matthew\\_patterson@fws.gov](mailto:matthew_patterson@fws.gov)

## 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 who are not yet members. Support is provided via a cash award of \$100 to the regional mollusk meeting 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.

### **Chesapeake Bay Freshwater Mussel Workgroup Meeting**

Matt Ashton (MDNR-Resource Assessment Service) and Julie Devers (USFWS-Maryland Fishery Resources Office) convened the annual Chesapeake Bay Freshwater Mussel Workgroup meeting at the FWS office in Annapolis, MD on January 28, 2014. The meeting was attended in person by 24 people and via web conferencing by 32 people representing numerous state and federal resource agencies, river basin commissions, non-profit organizations, and academia. Again, over half of the attendees participated via web conferencing making this an exceptionally green meeting! The morning session included updates on freshwater mussel training opportunities at the National Conservation Training Center, Dwarf Wedgemussel surveys in Maryland, mussel relocation in the Potomac River, *Corbicula* as biomonitors, hatchery production in Virginia, EPA's 2013 national ammonia criteria recommendations, and regional conservation efforts for Brook Floater.

The afternoon session included updates on several USGS studies; ecological services of mussels, habitat and water temperature models for Dwarf Wedgemussel, Delaware River mussel surveys, temperature models for the Delaware River, and the use of pheromones to guide American eels. Also included in the afternoon session were presentations on e-DNA techniques to detect rare mussels, the completion of a draft report on the ecological benefits of freshwater bivalve restoration to nutrient and sediment reduction goals (as required under the Chesapeake Bay Executive Order), and regional decision support tools for habitat restoration.

Following the presentations, brief discussions were held on plans for summer sampling and future meetings. With permission, presentations were loaded onto a file sharing site that has served as a repository for the workgroup. Financial assistance for the meeting graciously provided by FMCS through the awards committee supported refreshments in the morning and afternoon.

For more information about this meeting, contact Matt Ashton at [mashton@dnr.state.md.us](mailto:mashton@dnr.state.md.us) or (410) 260-8604.

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### **Fourth Biennial Southeast Atlantic Slope Mollusk Meeting**

North Carolina recently hosted the 4<sup>th</sup> biennial Southeast Atlantic Slope Mollusk meeting in Raleigh on January 21 and 22. There were 55 participants from Virginia, North Carolina, South Carolina, Georgia, and Florida, representing ten state agencies, two federal agencies, two universities, four nonprofit organizations, and two private companies.

In addition to general updates, presentations were given on several topics, including Wildlife Action Plan revisions, the South Atlantic Landscape Conservation Cooperative's Conservation Blueprint, conservation tools available through the Endangered Species Act, ecological flow restoration in the Savannah River basin, the Environmental Protection Agency's new water quality standards for ammonia, and an update on propagation, augmentation, and reintroduction efforts throughout the region. Anyone interested in notes from this meeting should contact Andrea Leslie ([andrea.leslie@ncdenr.gov](mailto:andrea.leslie@ncdenr.gov)).

Submitted by Andrea Leslie, North Carolina Natural Heritage Program

## Upcoming Meetings

**March 29 -- April 2, 2014** -- National Shellfisheries Association Annual Meeting, Hyatt Regency Jacksonville Riverfront Hotel, Jacksonville, Florida, Theme: [yet to be announced]  
<http://www.shellfish.org/annual-meeting> .

**April 24 – 25, 2014** – FMCS Workshop, Holiday Inn by the Bay, Portland, Maine, USA  
Theme: *Mussel Studies and Regulatory Process Associated with Dam Removals*.  
<http://www.molluskconservation.org/Events.html>

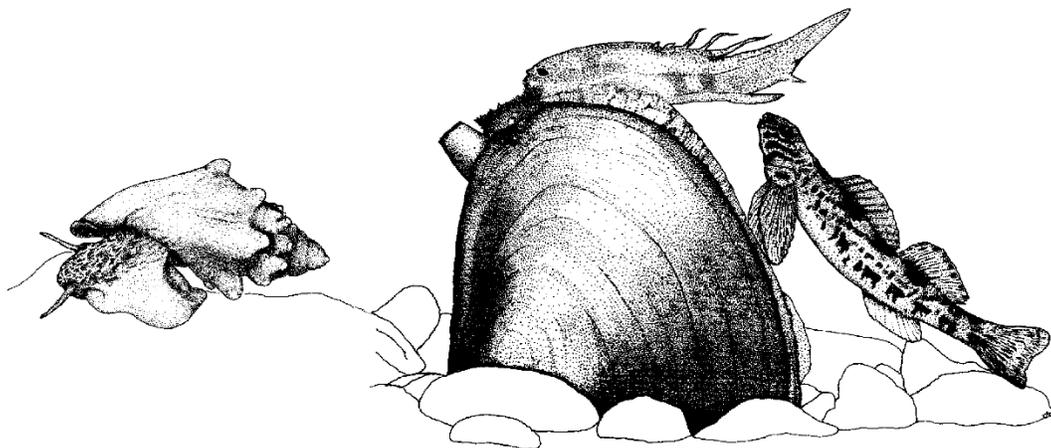
**May 18 – 23, 2014** -- The first ever Joint Aquatic Science Meeting (JASM), Portland, Oregon. This meeting will bring together four societies: Society for Freshwater Science, Association for the Sciences of Limnology and Oceanography, Society of Wetland Scientists, and Phycological Society of America. Theme: *Bridging Genes to Ecosystems: Aquatic Science in a time of Rapid Change*.  
<http://www.freshwater-science.org/Annual-Meeting/2014-Portland--JASM.aspx>

**June 23 – 27, 2014** -- **Mollusca 2014: The Meeting of the Americas** - Joint meeting of the Western Society of Malacologists, the Sociedad Mexicana de Malacología y Conquiliología, the American Malacological Society, and the Asociación Latinoamericana de Malacología. Library Complex Amoxcalli in the Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City, Mexico.  
<http://www.malacological.org/meetings.html>

**July 13 – 17, 2014** – Society for Conservation Biology North American Conference, Missoula, Montana, USA. <http://www.conbio.org/conferences/section-meetings>

**March 22-27, 2015** – FMCS Symposium/ Joint meeting with the Upper Mississippi River Conservation Committee, St. Charles, Missouri. Theme: Big Rivers and Landscape Ecology.

**March 7 – 10, 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.

### Cooperative Recovery Initiative Project – The Return of Big River Endangered Freshwater Mussels

**Patricia Morrison**, U.S. Fish and Wildlife Service (USFWS)

**Cooperators:** USFWS [Ohio River Islands NWR, WV Field Office, OH Field Office, MN Field Office, KY Field Office, PA Field Office, White Sulphur Springs National Fish Hatchery (WSSNFH), Northeast Fishery Center]; WV Division of Natural Resources; OSU/Columbus Zoo Freshwater Mussel Conservation and Research Center; Kentucky Center for Mollusk Conservation; Miami University; TN Wildlife Resources Agency; Lewis Environmental Consulting.

This group of cooperators received a grant to establish two to four new populations of endangered freshwater mussel species on or near the Ohio River Islands National Wildlife Refuge (Ohio River and tributaries). Four species were chosen (clubshell, purple cat's paw, orange-foot pimpleback, and spectaclecase) which will allow the team to maximize the chances for success over a three-year period. There is inherent uncertainty and risk in working with only one species of mussel in any given year – many factors may combine to undermine success, such as unworkable water conditions, loss of fish hosts in captivity, etc. The species chosen also represent different levels of imperilment, requiring different sets of recovery actions and activities. As it turned out, 2013 was indeed a high flow year in the Ohio River Basin. Nevertheless, the team accomplished major milestones, including the first ever propagation of the critically imperiled purple cat's paw. Work continues through FY 2015.

**Clubshell (*Pleurobema clava*):** 200 adults were collected from the Allegheny River, transported to WV, quarantined, PIT tagged, and stocked in the Ohio River (at 2 sites), and in the Little Kanawha River at Annamoriah. Tissue was collected from specimens in Middle Island Creek and Hackers Creek for comparison with Allegheny River populations. Biologists at WSSNFH successfully propagated juvenile clubshells in 2012 using common shiner, river chub, and mountain redbelly dace as fish hosts.



*P. clava* in their new home, Little Kanawha River, West Virginia



Juvenile *P. clava* propagated in 2012

**Orange-foot pimpleback** (*Plethobasus cooperianus*): Persistent high water in the Ohio and Tennessee Rivers delayed the search for this species. As of the week of October 28<sup>th</sup>, TN researchers had located three (3) individuals from the Tennessee River. The search will continue as flow and river conditions allow, and into next year. The lower Ohio River is now workable and cooperators spent eight days and collected nine individuals thus far. All 12 have now been aggregated into a holding site in the lower Tennessee River.

**Purple cat's paw** (*Epioblasma obliquata obliquata*): Cooperators were able to find 6 gravid females of this rare mussel and hold them in cages overwinter in Ohio streams for spring propagation work. In April 2013, three cooperator facilities received glochidea from these females and were able to attempt propagation. WSSNFH was successful using mottled sculpin as a host fish. To date, 14 juvenile purple cat's paw pearly mussels are growing at the KY Center for Mollusk Conservation.



Juvenile *Epioblasma o. obliquata*, 10 months old.



A nice variety of ages of *Cumberlandia monodonta* collected in the Green River in September 2013

**Spectaclecase** (*Cumberlandia monodonta*): Persistent high water in the Ohio River Basin this year also impacted the work with this species. Finally, in September, contractors were able to find and place 37 individuals in two cages and position them in the Green River so that they can be retrieved in the spring of 2014. None of the individuals examined were gravid, but hopefully they will be in spring. Students of Dr. David Berg from Miami University (OH) were able to swab all 37 individuals from the Green River in KY for genetic analysis. The plan is to have a comprehensive analysis of genetic variation for multiple populations from each of six rivers (Clinch, Ouachita, Osage, Meramec, Gasconade, and St. Croix) plus the Green River population. This encompasses most of the known significant populations of this species in the world.

## Tennessee's Mollusk Recovery Program

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

The State of Tennessee has historically supported 137 of the nation's 300 native freshwater mussel species (Order: Unionoida; Gerry Dinkins 2013, pers. comm. revision of Parmalee and Bogan, 1998) and over 300 of North America's 703 freshwater snails (Paul Johnson 2011, pers. comm.), making it the

second-most species-rich mollusk fauna of any state (Williams et al., 2008). Freshwater mollusks (mussels and snails) are proportionally the most imperiled group of animals (fauna) in the state of Tennessee and in the United States. The dramatic demise of this fauna nation-wide has occurred since industrial development and modification of rivers during the last century, resulting in the extinction or significant decline of over 70% of the species of mussels and 74% of the snails (Williams et al., 1993; Johnson 2011, pers comm.). Within Tennessee, the U.S. Fish and Wildlife Service has listed 51 mussel species and 2 freshwater snail species as endangered or threatened under provisions of the Endangered Species Act of 1973 (Butler 2013, pers. comm.). Several dozen more mollusk species in Tennessee are considered imperiled (Johnson and Butler 2013, pers. comm.). No other native faunal group in North America approaches this level of imperilment.

The Tennessee Wildlife Resources Agency (TWRA) is the regulatory body primarily responsible for conservation and management of Tennessee's mollusks and other biological resources. The TWRA must collaborate with other agencies and the public to implement, fund, and ensure effective resource stewardship. These cooperative efforts have resulted in the development of various tools and publications to help guide recovery and conservation efforts of mollusks, including the Tennessee State Wildlife Action Plan (TWRA, 2005), a Plan for the Controlled Propagation, Augmentation, and Reintroduction of Freshwater Mollusks of the Cumberlandian Region (Cumberlandian Region Mollusk Restoration Committee, CRMRC 2010), Tennessee Freshwater Mollusk Strategic Plan (Tennessee Chapter of The Nature Conservancy, 2013) and natural heritage databases (Tennessee Department of Conservation, Tennessee Valley Authority). These tools guide TWRA and our partners in our efforts to restore this globally important aquatic resource. In addition to these documents, TWRA aquatic species restoration actions follow the Myers' Rule (established by former TWRA Executive Director Gary Myers) which states "listed endangered/threatened species can be stocked into Tennessee waters/locations where other listed species are extant for these actions do not change the regulatory status of the site".

The objectives of the TWRA aquatic mollusk recovery program are:

- Establish additional populations of rare mollusk species in appropriate stream reaches
- Maintain existing mussel populations and biodiversity in high quality habitats
- Aid in the down- or de-listing of Threatened and Endangered mollusk species through creation of additional populations

### **Summary of 2013 Program Achievements**

Despite above average rainfall during 2013, TWRA was able to continue reintroduction and recovery efforts aimed at restoring freshwater mussel species diversity and distribution in Tennessee. Three federal endangered mussels were reintroduced into the Duck River: winged mapleleaf (thought to extirpated from Tennessee), pink mucket, and fanshell. Pink muckets were also reintroduced into the Elk and Nolichucky rivers and the Clinch population was augmented. The Alabama lampmussel was reintroduced into the Sequatchie River, expanding its distribution to three rivers in Tennessee (Emory, Elk, and Sequatchie). Four endangered Cumberlandian mussel species were stocked into established restoration sites in the Duck, Emory, and Nolichucky rivers. In total 17,354 mussels of 17 species, including 9 federally endangered, were stocked into 10 different sites in Tennessee waters during 2012-13 (Table 1). This work would not be nearly as successful without the assistance of our state partners in Alabama and Virginia. Over 50% of the mussels stocked during 2013 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.

### **References:**

- Williams, J.D., A.E. Bogan, and J.T. Garner. 2008. *The Freshwater Mussels of Alabama and the Mobile Basin of Georgia, Mississippi, and Tennessee*. University of Alabama Press, Tuscaloosa, AL. 908 pp.
- Williams, J.D., M.L. Warren Jr., K. S. Cummings, J. L. Harris, and R. J. Neves. 1993. Conservation status of freshwater mussels of the United States and Canada. *Fisheries* 18(9):6-22.

Table 1. 2013 TWRA mussel translocations and stockings.

Sites	Clinch River Kyles Ford	Duck River Littlelot	Duck river Lillard's Mill	Elk River below Harms Mill <sup>1</sup>	Elk River Winding Stair Bluff <sup>2</sup>	Emory River at Oakdale	Hiwassee River McClary Island <sup>3</sup>	Nolichucky River TWRA Canoe access	Pigeon River Wilton Springs	Sequatchie River Kettner's Mill	Totals
<b>Species</b>											
Actinonaias ligamentina									372		372
Actinonaias pectorosa									4		4
Cyclonaias tuberculata									88		88
Cyprogenia stegaria*			54								54
Elliptio dilatata									108		108
Epioblasma brevidens*			599					400			999
Epioblasma capsaeformis*						738	2296	1807			4841
Epioblasma triquetra*			27								27
Lampsilis abrupta*	100	121	298	200				130			849
Lampsilis fasciola									237		237
Lampsilis ovata									5		5
Lampsilis virescens*				1462	3000					1800	6262
Lemiox rimosus*								330			330
Medionidus conradicus						200	800	549	34		1583
Ptychobranhus fasciolaris									76		76
Ptychobranhus subtentum*			602					675			1277
Quadrula pustulosa									17		17
Quadrula fragosa*		103									103
Villosa iris									122		122
<b>Totals</b>	<b>100</b>	<b>224</b>	<b>1580</b>	<b>1662</b>	<b>3000</b>	<b>938</b>	<b>3096</b>	<b>3891</b>	<b>1063</b>	<b>1800</b>	<b>17354</b>

\* Federal Endangered Species  
 1 - L. virescens stocked 2010-12  
 2 - stocked in 2012  
 3 - stocked in 2012

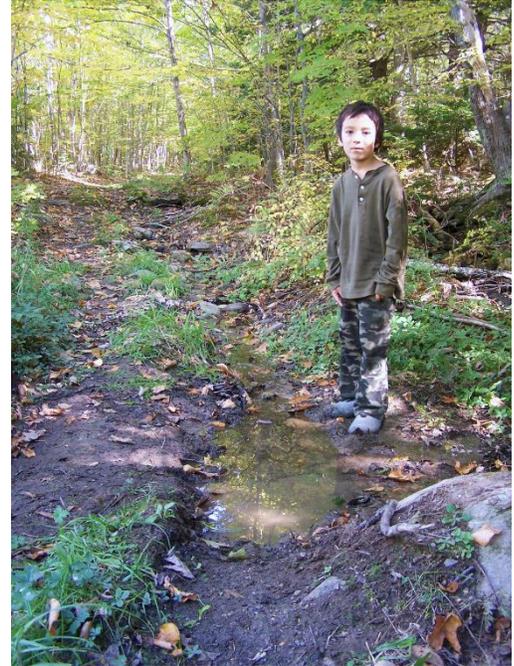
## A Curious Case of Mud Puddle Mussels

Beth Swartz \*, Linnaeus Orlov, and David Spahr

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After 27 years of taking phone calls from the public reporting fantastic things they claim to have seen, I have learned to never say “never”. When David Spahr called last July to tell me about the freshwater mussels his young friend Linnaeus Orlov had found living in what amounted to a mud puddle in the middle of a woods road, I listened politely to what I was sure would end up a misidentification. Hoping to avoid having to defend my skepticism, I asked if he took any photos. Well he had, and sent them right off to me. Once again, I was reminded to always keep an open mind. His photos clearly showed - yes - a shallow mud puddle, with no visible connection to a permanent body of water, FULL of *Elliptio complanata* and at least one *Pyganodon cataracta*. No longer doubtful, now I was confused and curious. So I went to see for myself.

Wearing knee high muck boots, because I just could not believe we would find mussels without getting our feet wet, I followed David, Linnaeus, and his dad a few hundred yards down an old tote road near Linnaeus’ home in the woods. They stopped by a low wet spot where all-terrain vehicles (ATVs) had dug up a short stretch, creating a small puddle about three feet long, a foot and a half wide, and a couple inches deep. David reached down and easily came up with a good sized *Elliptio*. I bent down to look closer and was dumbfounded. The bottom of the puddle was carpeted with mussels. Their trails crisscrossed its length and they looked, well, as happy as clams.



Linnaeus Orlov stands next to the mud puddle where he discovered freshwater mussels living in the summer of 2013. Photograph by Beth Swartz



More than 50 *Elliptio complanata* and at least one *Pyganodon cataracta* survive in a small puddle formed by spring water collecting in an ATV tire rut. Photograph by David Spahr

In all directions, there was not a lake, pond or stream in sight. The puddle was fed solely by spring water draining off the adjacent hillside and running down a tire rut through the puddle into a shallow roadside ditch. The water was cold and clear, until you stirred it up, then it became too muddy to see anything. We rooted around and easily found at least 50 *Elliptio*, most of a similar, medium size, but some larger or smaller. I’m sure there were more. How on earth did they get here? The most plausible theories we came up with were: 1) they were dumped here by someone who had collected a bucket of

“clams” for supper and changed their mind; or 2) juvenile mussels were picked up in the tire treads of an ATV somewhere else and then spun out into the puddle when the rider got stuck in the mud. We briefly considered a third possibility: this puddle was also full of inch long larval salamanders (likely *Desmognathus fuscus*?), making us wonder if they could have brought them here. But salamanders are not a known host for *Elliptio*, and where would they have picked up glochidia in the first place?

Unfortunately, how the mussels came to be in the mud puddle will likely remain a mystery. The other burning question that will never be answered is “How long had they been there?”. More than two months had passed before I was able to make the trip to see them in early October, and they were still alive. Given the tolerance of *E. complanata* and *P. cataracta* to less than ideal conditions, it was not hard to believe they could survive the confines of their tiny pond--even at a density equivalent to  $>100/m^2$  --as long as cool water continued to flow through, bringing oxygen and food. If the puddle dried for short periods of time, as David said it had, as long as they could burrow down in the 4 inches of soft mud lining the rut, perhaps they could ride out brief periods of drought. The thick cushion of mud also probably explained how they were able to survive being run over by an occasional ATV. How long had they managed to avoid discovery by a hungry raccoon? Covered with a blanket of snow, was it possible they had survived a Maine winter?

That day, I had gone prepared to rescue the mud puddle mussels and relocate them to a nearby lake where both species were present. I decided, instead, to leave them there. It was not a comfortable decision, but I wanted to see if they were still alive in the spring. We might not ever know how long they had been there, but maybe we could at least find out if they had actually been able to persist in that puddle for more than one short Maine summer.

In the months since Linnaeus eagerly showed me his discovery, I have thought about those mussels often, wondering of their fate. Now, in the midst of a very harsh winter, it’s difficult to believe we will find anything come spring but a mud puddle full of empty shells. But, then, I remind myself, “Never Say Never”!

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## Monitoring of Translocated Northern Riffleshell and Clubshell in Illinois

Jeremy Tiemann, Illinois Natural History Survey

The recovery plan for the federally-endangered Northern Riffleshell (*Epioblasma rangiana*) and Clubshell (*Pleurobema clava*) listed an objective of establishing viable populations of the species in ten separate river drainages throughout their respective ranges. The recovery plan stated that population augmentations and reintroductions would be needed to achieve this objective, and the Vermilion River (Wabash River drainage) in Illinois was agreed upon as a potential location for reintroduction.

Beginning in 2005, Illinois partnered with the U.S. Fish and Wildlife Service and state agencies in Ohio and Pennsylvania and began planning the release of these species into the Vermilion River. The goal was to re-establish self-sustaining Northern Riffleshell and Clubshell populations in their historical ranges in Illinois. A bridge construction project on the Allegheny River in Forest County, Pennsylvania, provided the opportunity to move members of both species to the Vermilion River basin in Champaign and Vermilion counties, Illinois. Animals were moved in 2010, 2012, and 2013, and all animals were affixed with passive integrated transponder tags, which have allowed researchers to monitor the animals since then.

To date, 1,349 Northern Riffleshell and 958 Clubshell have been translocated from the Allegheny River to eight sites in the Vermilion River basin (five in the Middle Fork and three in the



A tagged clubshell mussel now living in the Vermilion River basin when it was picked up for closer inspection.

Salt Fork). Since the inception of the monitoring program, the detection rate per survey per site has varied from 18% to 100% for the Northern Riffleshell and from 37% to 100% for the Clubshell. Of the individuals encountered and inspected during this project, 56% of the Northern Riffleshell and 78% of the Clubshell have been alive.

A pdf copy of the 27-page Illinois Natural History Survey report on this monitoring project is available at <https://www.ideals.illinois.edu/handle/2142/47102>. This relocation project is being funded, in part, by a natural resource damage assessment settlement (Hegeler Zinc—Lyondell Basell Companies) to the U.S. Fish and Wildlife Service and the State of Illinois.

Jeremy Tiemann (snorkeling), Austin Haskett, and Rachel Vinsel of INHS monitoring the translocated mussels in a Vermillion River stream. Both photographs by Rob Kanter, University of Illinois.



### James Spiny mussel, *Pleurobema collina* (Conrad, 1837) Conglutinates

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A dazzling variety of behaviors have evolved in freshwater mussels to facilitate glochidia encountering host fishes (Barnhart *et al.*, 2008). Many species in the genus *Pleurobema* utilize cyprinids as glochidial hosts (Williams *et al.*, 2008) and package their young in conglutinates, which are thought to mimic food items. Laboratory studies showed that *P. collina* glochidia metamorphose on cyprinids (Hove and Neves 1994). Conglutinates released by *P. collina* were described in Hove and Neves (1994) but photographs were not included in that publication. Conglutinate form and function are interesting to consider while contemplating a mussel's life history, and can inform phylogenetic relationships (Watters 2008).

As part of the research described in Hove and Neves (1994), I examined James spiny mussel conglutinates. *Pleurobema collina* released mature glochidia in elongate, slender conglutinates that were 4-14 mm long and 1-1.5 mm wide (Figure 1). The glochidia were enclosed in a thin, transparent gelatinous sheath and arranged in 1-2 staggered rows around the entire to half the conglutinate margin (Figure 2). Inside the center of most conglutinates was a thin ribbon of tan to light brown pigment, similar in color to the streambeds *P. collina* inhabit (Figure 3). Pigment ran the length of some conglutinates, portions of others, and some were clear. I pressed the center of a few conglutinates with a probe and nearby glochidia popped out of the conglutinate, and then recoiled to the conglutinate edge. Using a probe, I pushed glochidia away from the conglutinate, but when released they came back to rest along the conglutinate. Rarely, glochidia were arranged throughout a portion of the conglutinate (Figure 4a). Immature glochidia were released in white, helical conglutinates (Figure 4b).



Figure 1a. James spiny mussel (note spine near umbone) with conglutinates.

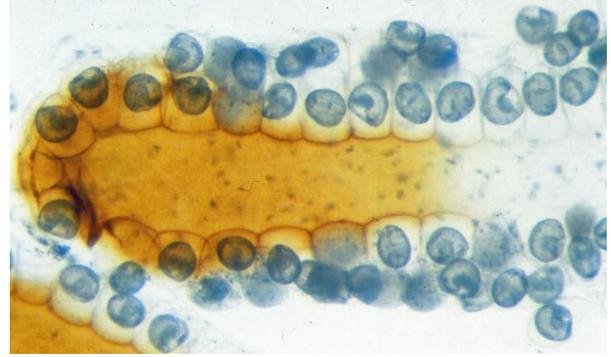


Figure 1b. Conglutinate close-up



Figure 2a. *P. collina* conglutinates (bright field)

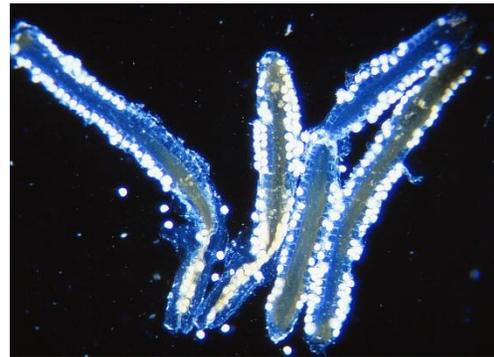


Figure 2b. *P. collina* conglutinates (dark field)

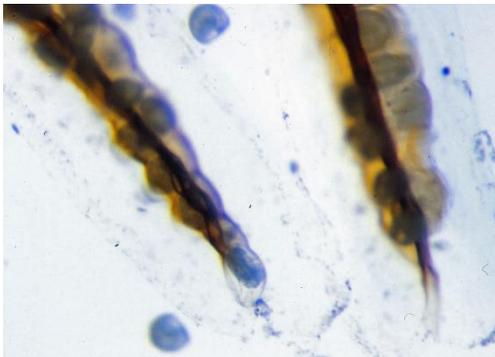


Figure 3a. Conglutinate tips (bright field)



Figure 3b. Conglutinate tips (dark field)



Figure 4a. Glochidia unusually numerous and broadly distributed

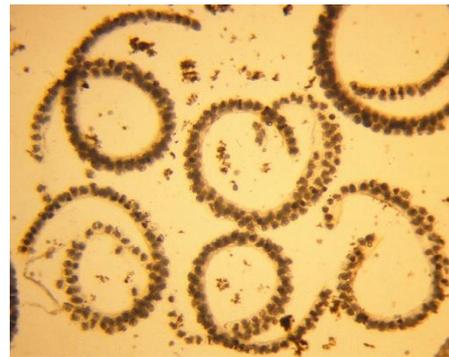


Figure 4b. Conglutinates with immature glochidia

Limited observations suggest cyprinids might ingest conglomerates under natural conditions. In the laboratory, a few rosefin shiners briefly inhaled and then spit out the conglomerates. Conglomerates lying naturally on the streambed of South Fork Potts Creek were ignored by nearby bluehead chubs but two chubs and a redbreast sunfish each grabbed one conglomerate dropped onto the water surface.

James spinymussel glochidia release behavior offers food for thought regarding phylogenetic relationships. Over time, this mussel has been placed in different genera (*e.g.*, *Elliptio*, *Canthya*, *Fusconaia*). *Elliptio* species release whole conglomerates while others release glochidia in broken conglomerates or in mucus strands (Williams *et al.*, 2008). James spinymussels release mature glochidia in solid, whole conglomerates, which is consistent with its placement in *Pleurobema*. On rare occasions, James spinymussel glochidia are arranged throughout the conglomerate like other *Pleurobema* species, however, normal glochidial organization is different than other *Pleurobema*. In a recent genetic analysis (Campbell and Lydeard 2012), the authors noted *P. collina* did not group with other *Pleurobema* species. Further research into characteristics of Pleurobemini species should help resolve the taxonomic placement of the James spinymussel.

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### Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel *Sinanodonta woodiana*, 34. News from Poland, Serbia and Turkey

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Papers dealing with the presence of the invasive Chinese Pond mussel *Sinanodonta woodiana* (Lea, 1834) in Europe continue to be published. Here is some new information from Poland, Serbia and Turkey.

#### Poland

A study of the morphology of the glochidial shells of *Sinanodonta woodiana* from the Odra (=Oder) River near Szczecin and Gosławskie Lake, part of the Konin Lakes in Poland showed that they resemble closely those of *Sinanodonta woodiana* from localities in Asia, except from *Sinanodonta* species living in the Primorye region, Russian Far East (Sayenko & Soroka, 2013).

#### Serbia

During an ecological survey of the aquatic macro-invertebrates inhabiting the Zapadna Morava River (=Western Morava River), Serbia, the Chinese Pond mussel was encountered at two localities: in low abundance at Kraljevo and a single specimen at Maskare (Novaković, 2013).

A survey of the benthic fauna of the Serbian part of the Danube River showed that the Chinese Pond mussel was present at 8 out of a total of 14 localities (Tubić *et al.*, 2013). Interestingly *Sinanodonta woodiana* was not encountered in the Iron Gate stretch of the Danube.

Kolarević et al., 2013 carried out a study to investigate the potential of *Sinanodonta woodiana* for the detection of genotoxic pollution of the environment. The study took place on material collected at two sites in the Velika Morava River (=Eastern Morava River). The results showed that the Chinese Pond mussel might be a valuable tool for active biomonitoring of aquatic environments and emphasizes the importance of seasonal genotoxic monitoring with that organism.

### Turkey

During an ecological survey of the freshwater bivalves of Lake Sapanca, N.W.-part of Asiatic Turkey, a single specimen of *Sinanodonta woodiana* was collected in the Maşukiye Stream close to its entrance into the lake (Ercan et al., 2013). It constitutes the first record of this invasive species from Turkey of which only a small part is situated in Europe.

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## Note on Some Recent Records of the Eared Pond Snail *Radix auricularia auricularia* in Israel

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The nominate subspecies *Radix auricularia auricularia* (Linnaeus, 1758), Fam. Lymnaeidae, or Eared Pond snail, has been reported from the Early-Middle Pleistocene (0.78 Ma) of Gesher Benot Ya'aqov, Israel (Mienis & Ashkenazi, 2011). But, like so many other typical palaeartic species, it almost disappeared from the region towards the Late Pleistocene, leaving a few isolated populations in some marshy areas in the Mediterranean coastal plain and the Hula swamps. All these disappeared when the wetlands were drained in the 20<sup>th</sup> Century when the malaria-infested and evil marshes were turned into "healthy" agricultural fields. The last ones were the swamps around and including the Hula Lake in Upper Galilee in 1958 (Dimentman et al., 1992).

However, a local subspecies: *Radix auricularia virginea* (Preston, 1913), which had developed in the basin of the Sea of Galilee, managed to maintain a foothold until now, although it has never been very common. This subspecies is characterized by its relatively small size ( $\pm$  12 mm) and especially by its peculiar rose-whitish shell (Preston, 1913; Milstein et al., 2012). The nominate species may grow to a size of 20 mm and even more and its shell is normally of a horny colour. Nevertheless, from time-to-time, temporary populations have turned up throughout Israel, usually in man-made habitats like ponds and reservoirs. The following finds in chronological order are known to the authors:

- Tel Aviv, Abu Kabir, pond in former Botanical Garden of the Tel Aviv University, leg. D. Gold & J. Lengy, 1965-1967 (TAU MO 29987/6; 29988/2); idem from an aquarium, leg. A. Barash, 25 May 1967 (TAU MO 29989/1);
- Zemorot near Nizzanim leg. M. Sade, 15 January 1969 (TAU MO 29990/8);
- Jerusalem, Givat Ram Campus, pond near Canada hall, leg. H.K. Mienis, May 1973 (HUJ 12564/2 and TAU MO 73142/2);
- Eshkol Reservoir, leg. Ch. Dimentman, 4 November 1986 (HUJ 37481/3);
- Soreg Reservoir, Lower Galilee, leg. Mekorot, 24 February 1993 (HUJ 38103/4).



Figure 1: *Radix auricularia auricularia* and *Radix auricularia virginea*. Photograph by Oz Rittner

Little is known about how these snails reached those aquatic habitats. We have some additional information only about the specimens collected in the pond of the former Botanical Garden of the Tel Aviv University at Abu Kabir. They were used for the Ph.D.-thesis of Daniel Gold (1972), which was carried out under the supervision of the parasitologists Prof. Gideon Witenberg and Prof. Jacob Lengy of the Tel Aviv University. We do not rule out the possibility that at one time or another material of *Radix auriculata auriculata* was received from European sources. Moreover, in the last 20 years, numerous shipments of freshwater plants have arrived from various European countries, some of which might have served as carriers of *Radix auricularia auricularia* or their egg-masses.

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## Richness, Regional Distribution and Conservation Situation of Freshwater and Amphibian Mollusks in Santa Catarina State/ SC, Central Southern Brazil: a Preliminary Evaluation

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<http://noticias-malacologicas-am.webnode.pt>

Through timely and effective participation of our employees in the field, recently was achieved and recorded recently by "Project AM" the brand of 220 species and subspecies of continental mollusks (190 gastropods - 148 terrestrial, 40 limnic/ freshwater and 2 amphibious, and 30 freshwater bivalves) checked for the geographical territory of the State of Santa Catarina/ SC, central portion of the southern Brazil (Agudo-Padrón 2010, 2011 b) (Figure 1). This total includes 97 genera and 37 families, a modest product of 18 complete years of research and disseminating continuously developed in this state.

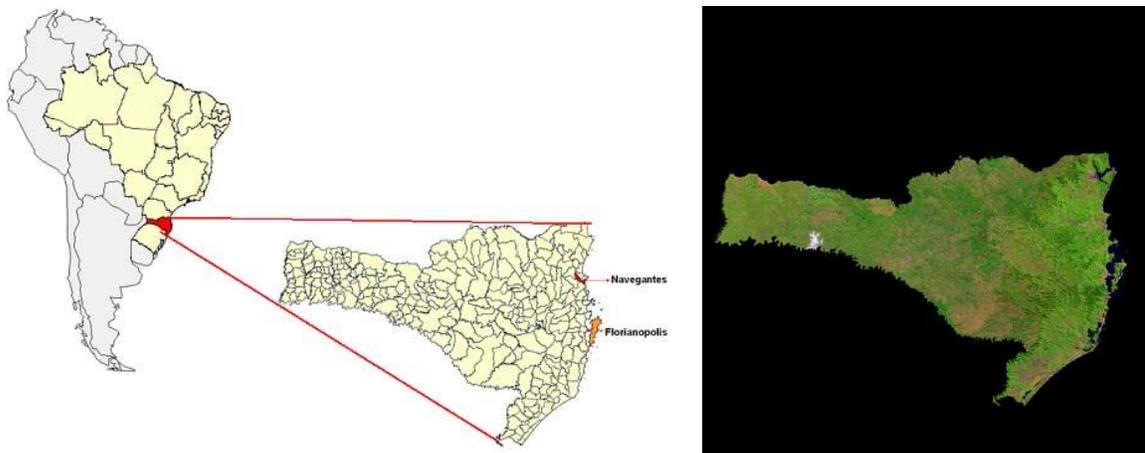


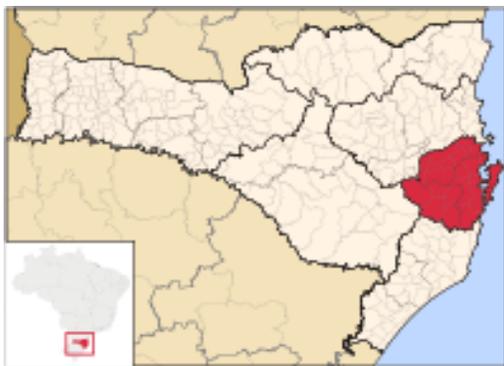
Figure 1.- Santa Catarina's State/ SC, Central Southern Brazil

For the purposes of recognizing the spatial distribution presented by the richness of continental freshwater and amphibious mollusks verified, we divided the state into six great regions (Figure 2), based on their bio-ecological and geographical characteristics – for a detailed description, see Agudo-Padrón (2008: 149-150) and Agudo-Padrón *et al.* (2013c: 14-31), presenting a representative native species in each:



Figure 2.- The six great regions of Santa Catarina's State/ SC

- 1 ) Great Florianópolis region, coastal and mountainous
- 2 ) Northern region
- 3 ) Western region
- 4 ) Highlands region
- 5 ) Southern region, and
- 6 ) Itajaí River Valley region



- 1 ) **Great Florianópolis Region** (map) – *Omalonyx convexus* (Heynemann, 1868)  
 24 species (6 Bivalvia, 18 Gastropoda – 1 amphibian)  
 2 exotic and invasive (1 Bivalvia, 1 Gastropoda)  
 6 under immediate threat of extinction (5 Bivalvia, 1 Gastropoda)



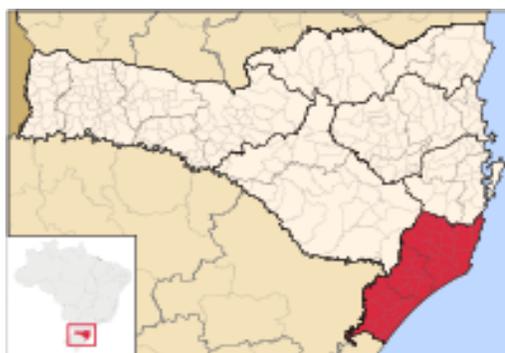
- 2 ) **Northern Region** (map) – *Biomphalaria tenagophila* (d'Orbigny, 1835)  
 11 species (4 Bivalvia, 7 Gastropoda)  
 3 exotic and invasive (2 Bivalvia, 1 Gastropoda)  
 4 under immediate threat of extinction (1 Bivalvia, 3 Gastropoda)



- 3 ) **Western Region** (map) – *Asolene (Pomella) megastoma* (Sowerby, 1825)  
 40 species (23 Bivalvia, 17 Gastropoda)  
 4 exotic and invasive (3 Bivalvia, 1 Gastropoda)  
 21 under immediate threat of extinction (13 Bivalvia, 8 Gastropoda)



- 4 ) **Highlands Region** (map) – *Chilina globosa* Frauenfeld, 1881  
 15 species (6 Bivalvia, 9 Gastropoda)  
 1 exotic and invasive Gastropoda)  
 11 under immediate threat of extinction (5 Bivalvia, 6 Gastropoda)



- 5 ) **Southern Region** (map) – *Pomacea sordida* (Swainson, 1822)  
 24 species (8 Bivalvia, 16 Gastropoda – 1 amphibian)  
 4 exotic and invasive (2 Bivalvia, 2 Gastropoda)  
 10 under immediate threat of extinction (5 Bivalvia, 5 Gastropoda)



- 6 ) **Itajaí River Valley Region** (map) – *Potamolithus catharinae* Pilsbry, 1911  
 28 species (8 Bivalvia, 20 Gastropoda – 2 amphibian)  
 7 exotic and invasive (2 Bivalvia, 5 Gastropoda – 1 amphibian)  
 10 under immediate threat of extinction (5 Bivalvia, 5 Gastropoda)

Based on the above information, the Uruguay River Basin (Region 3 - Western Region) stands out once again, which according to previous surveys, was found to be one of the "hotspots" of the world (it is the river with the greatest biodiversity of mollusks in Latin America), followed immediately by the subtropical valley of the Itajaí-Açu River Basin (Region 6), in the Atlantic Slope Forest domain of central southern Brazil, the largest Atlantic drainage basin of the State.

In general, the study of the non-marine molluscan biodiversity in the State of Santa Catarina/ SC, the smallest portion (central) of the geospatial southern Brazil region, is urgent in view of the rapidly changing natural environment due to human activities and the rapid invasion by exotic species.

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## **New Occurrences of Freshwater Mussels/ Naiads and Other Mollusk Species in Fish Farms/ Dams of Santa Catarina State/ SC, Central Southern Brazil Region**

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Giving continuity to the research, and as previously described (Agudo-Padrón 2012, 2013), several freshwater/ limnic naiads living in southern Brazil can successfully adapt to the artificial conditions imposed by man in this region, including, particularly, the artificial lakes and cultures for fish farming that proliferate in this localities (Figure 1). *Anodontites trapesialis* (Lamarck, 1819), one of the largest freshwater bivalves of South America (Agudo-Padrón 2012), is the most important and common species involved in this case.

Recently, we have found two new fish farms/ dams in the “Itajaí River Valley” region in the Southern Brazil territory of Santa Catarina State/ SC, that have been reported to have problems caused by the presence/ occurrence of this native naiad, and other mollusk species (Figures 2-4).

**References:**

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Agudo-Padrón, A.I. 2012. Conflictive incidence of native freshwater mussels/ naiads in fish farms/ dams of the Santa Catarina's State, Central Southern Brazil. *FMCS Newsletter Ellipsaria*, 14(4):37-41.

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Figure 1.- Typical rural artificial lakes/ cultures of fishes in the “Itajaí River Valley” region, Santa Catarina State/ SC, Central Southern Brazil. Photographs by Carlos Magno de Lima e Silva, UNIVALI/ Itajaí, SC (29/11/2013).



Figure 2.- Specimens of *Anodontites trapesialis* (Lamarck, 1819) (left) and *Anodontites patagonicus* (Lamarck, 1819) (right) captured in fish farm/ dam of “Benedito Novo” Municipal District (map - red color), Santa Catarina State/ SC, Central Southern Brazil region. Photographs by Carlos Magno de Lima e Silva, UNIVALI/ Itajaí, SC (29/11/2013).



Figure 3.- *Anodontites trapesialis* (Lamarck, 1819) (upper) and *Anodontites patagonicus* (Lamarck, 1819) (below) specimens, captured in fish farm/ dam of “Indaial” Municipal District (map - red color), Santa Catarina State/ SC, Central Southern Brazil region. Photograph by Carlos Magno de Lima e Silva, UNIVALI/ Itajaí, SC (29/11/2013).

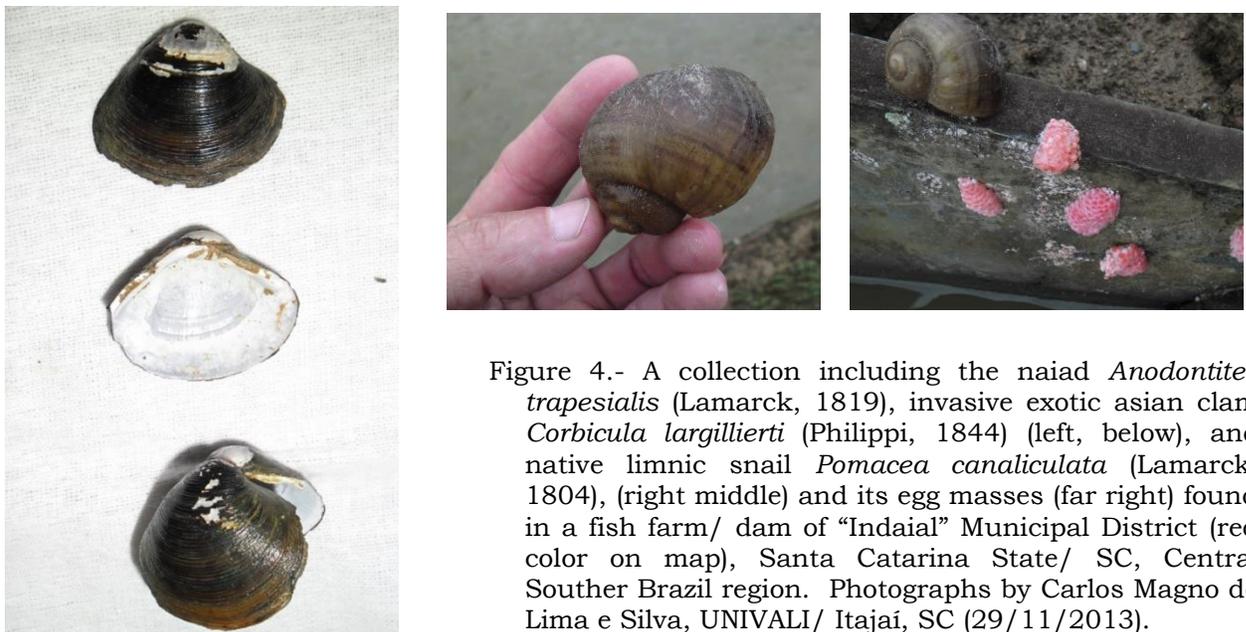


Figure 4.- A collection including the naiad *Anodontites trapesialis* (Lamarck, 1819), invasive exotic asian clam *Corbicula largillierti* (Philippi, 1844) (left, below), and native limnic snail *Pomacea canaliculata* (Lamarck, 1804), (right middle) and its egg masses (far right) found in a fish farm/ dam of “Indaial” Municipal District (red color on map), Santa Catarina State/ SC, Central Souther Brazil region. Photographs by Carlos Magno de Lima e Silva, UNIVALI/ Itajaí, SC (29/11/2013).

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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 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 *Lampsilis siliquoidea*, along with many other native mussels, was observed in its natural feeding position in July 2013, during a survey of Eagle Creek, near Garrettsville, Ohio. Photographs were taken of the mussels in the substrate prior to removing them for species identification. The siphons would retract when sediment was kicked up in front of the mussel and when it sensed changes in the pressure of the flowing water associated with movement of the camera (about 6 inches away). In either case, the siphons would quickly return to their fully extended position. Photograph taken by Matt Begley, a graduate student at Cleveland State University.

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).

