



Newsletter of the Freshwater Mollusk Conservation Society

Volume 20 – Number 2

June 2018



'You'll Catch Your Death of Cold' Didn't Happen A Balmy, Stimulating Workshop on Freshwater Mollusk Health and Disease

The FMCS Mollusk Health and Disease Workshop was held March 13-15, 2018, at the Radisson Hotel in La Crosse Wisconsin. The weather cooperated in making the week a pleasure, with highs in the 50's and no new snow. More than 120 people attended from across the United

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States, and from Canada, Finland, Italy, Poland, Spain, and Sweden. Accommodations at the hotel were great, the meetings rooms were excellent, and everyone learned a lot.

Tuesday, the first day of the Workshop, was spent in a lecture format covering many aspects of mollusk health and disease. Individual talks, many given by experts on subjects other than freshwater mollusks per se, addressed the history of mollusk health and diseases, the causes of freshwater mussel declines, viruses, bacteriology, parasites, insights from the marine bivalve disease realm, health assessment tools, “omics,” condition indices, hemolymph chemistry and fatty acid analysis in freshwater mussel health, the microbiome of the Alabama Rainbow, disease risk analysis, disease risks presented by dreissenids, invasive snails as potential hosts for parasites in the Midwest, factors related to growth inhibition in juvenile mussels, the 1999 Ohio River Mollusk Kill assessment: the gastropod story, and a review of freshwater mussel die-offs. Tuesday ended with a poster session hosting 22 posters and a *welcome* social.



All day Wednesday and Thursday morning found participants divided into three groups. Each group rotated through half-day sessions in the laboratory at the Midwest Fisheries Center doing hands-on work with specimens and slides; in a Risk Characterization Session learning about the process of, and developing parts of a mollusk disease risk assessment; and in a die-offs and kills session where methods for evaluating a die off, valuing the loss based on the new Monetary Values book, and improving the sampling methods for disease assessment were discussed. Wednesday ended with a social featuring local Pearl Street and New Glarus beers and a jam session, where Workshop attendees showed off their talents with guitar, mandolin, ukulele, flute, and song. Special thanks to guest jam session anchors Matt Shortridge and Paul Fairchild.





The Workshop concluded Thursday afternoon with a tour of Genoa National Fish Hatchery, a great opportunity to spend some time informally discussing culture techniques and ways to deal with diseases and die-offs -- and to view the Mississippi River and the migratory birds that were passing through during the beautiful weather.



All presentations from the Mollusk Health and Disease Workshop are available on the FMCS website at: https://molluskconservation.org/EVENTS/2018Workshop/2018_FMCS-Workshop-PRESENTATIONS.html.

This Workshop would not have been possible without support from sixteen sponsors and the dedicated efforts of the Workshop Committee. We received sponsorships from the Mississippi Interstate Cooperative Resource Association (MICRA), Enviroscience, Wisconsin Department of Natural Resources, Virginia Department of Game and Inland Fisheries, Upper Mississippi River Conservation Committee, Ecoalysts, Exelon, EPRI, Dairyland Power, The Nature Conservancy, Kentucky Department of Fish and Wildlife Resources, TRC, Minnesota Zoo, Friends of the Upper Mississippi, Festival, and Rebecca Winterringer. Their support is greatly appreciated!

Workshop organizers Diane Waller and Megan Bradley, along with Nathan Eckert, Emily Grossman, Lisie Kitchel, Jeremy Tiemann, Shelly Bartsch, Heidi Dunn, Corey Puzach, Louise LaVictoire, and Greg Cope did a great job and kept everything running smoothly.

Thanks to all of the presenters (Greg Cope, Diane Waller, Wendell Haag, Tony Goldberg, Eric Leis, Andrew McElwain, Ryan Carnegie, Teresa Newton, Ieva Roznere, Serena Ciparis, Andrea Fritts, Cova Arias and Alison Aceves, Tiffany Wolf, Daniel Molloy, Greg Sandland, Janet Clayton, and Jordan Richards) for taking the time to put together relevant and informative talks. Special thanks are due to the presenters who don't normally work with freshwater mollusks but spent the time to apply their specialty to our interests and expanded the scope of this Workshop. Thanks, also, to Janet Clayton, John Jenkinson, and Chris Barnhart for taking pictures during the Workshop.

More pictures from the Mollusk Health and Disease Workshop



Society News

Minutes of the Spring 2018 FMCS Board Meeting Wednesday, March 14, 2018



Call to order was made by President Heidi Dunn at 5:06 CDT. Board Members in attendance were Heidi Dunn, Emily Grossman, Janet Clayton, Jeremy Tiemann, Teresa Newton, Lisie Kitchel, John Jenkinson, Steve McMurray, Rachael Hoch, Tim Lane, Greg Cope, Wendell Haag, Braven Beaty, Emy Monroe, Nicoletta Riccardi, Tyler Hern, Brian Watson, Ryan Schwegman, and participating by phone were Nathan Whelan and Becca Winterringer. Non-Board attendees included Megan Bradley, Maria Urbanska, Celeste Searles Mazzacano, Amy Maynard, Beth Glidewell, Niklas Wengstroem, and Jouni Taskinen. A quorum was established.

A motion was made by John Jenkinson to approve the December 2017 Board Meeting Minutes (published in the March 2018 *Ellipsaria*), with a second by Braven Beaty. All approved.

Treasurer's Report – Emily Grossman

2018 Workshop Update (as of 3/8/18)

We have 110 people pre-registered for the workshop, with speakers about 125. We have received sponsorships from Dairyland Power Coop, MICRA, Exelon, VDGIF, EcoAnalysts, EnviroScience, EPRI, Becca Winterringer, Tracy Engle (Becca's supervisor), The Nature Conservancy, TRC, Kentucky (Monte McGregor), and Wisconsin DNR. Funds from UMRCC and the Minnesota Zoo are also expected.

Workshop income to date

- | | |
|--|---------------|
| • Registration: | \$18,671.25 |
| • Sponsorships: | 6,902.00 |
| • Field trip: | 1,100.00 |
| • T-shirts: | 400.00 |
| • AFS values books: | <u>718.90</u> |
| Total workshop income to date: \$27,792.15 | |

Other income and expenses, 12/14/17 – 3/8/18

Income

• Memberships:	\$5,060.00
• Past years t-shirts, hats, etc.:	5.00
• Interest:	<u>23.09</u>
Total non-symposium income:	\$5,088.09

Expenses

• 2018 workshop expenses:	\$2,992.50
• Italy meeting deposit:	1,000.00
• Allen Press/FMBC costs:	30.60
• PayPal/Square fees & misc:	<u>749.88</u>
Total expenses:	\$4,772.98

Bank balance

• Checking:	\$55,924.74
• Savings:	110,096.41
• PayPal:	<u>1,009.27</u>
Total:	\$160,530.42

Emily questioned whether we needed to develop a policy for sponsorships. Does a sponsorship include covering registration fees for speakers, etc.? Heidi Dunn said if the budget could afford it, then it could be covered or if the organization would cover it in addition to the sponsorship, even better. Either way, it is the responsibility of the attendee to register for the meeting and payment could be addressed on a case-by-case basis.

Secretary's Report – Janet Clayton

We have 325 regular members, 82 student members, 18 lifetime members, and 5 contributing members. She continues to send out email blasts as requested and to forward items to the Unio list-serve.

Old Business:**Update on CASS and AFS liaison** – Jeremy Tiemann

Jeremy, Braven Beaty, and Heidi recently discussed a plan to deal with Consortium of Aquatic Sciences Societies (CASS) activities, as it is a very active group. Braven noted a CASS societies' Joint Aquatic Sciences Meeting (JASM) meeting is being planned for 2022 and would like to know if FMCS is interested in being a part of the meeting. FMCS could host a separate workshop that year or just attend the meeting. AFS was the only association that sent in a proposal to lead the meeting. There is currently no theme developed for the JASM meeting. Currently there are three options for FMCS to consider: no one to attend, send a small scouting group, or do a special session. Wendell Haag suggested that, at a minimum, we should have a booth as has been done at other meetings.

Redefining of Dues Schedule – Heidi Dunn

At the December 2017 Board Meeting, it was recommended that dues would be changed as follows: Student/Retiree - \$40/2 years, Regular - \$80/2 years, Contributing -\$250/2 years, and Lifetime - \$800. However, the definition for retiree was not established at that meeting.

The following options were suggested: a) age requirement (65?), b) retired from a career position, or C) retired from a career position and not working more than 20 hours per week. Wendell Haag made a motion to define retiree as “retired from a career position” and Steve McMurray provided a second. All approved. These new membership rates will apply starting in 2019. [See article comparing old and new rates on Page 18.]

New Business

Committee Reorganization

As written, our by-laws identify specific Standing Committees. The new National Strategy has goals and objectives that may not fit into the committees as listed in the by-laws, and existing committees may no longer serve a purpose. A change is needed to make this more flexible. President Dunn suggested we consider changing the by-laws to have three general categories of committees.

- Functional Committees - take care of on-going society activities/functions (e.g., symposium, awards, publications, and nominations).
- Technical Committees - meet the needs of the National Strategy and should be evaluated each time a new national strategy is prepared. Also, perhaps, broader technical committees that could form subcommittees to tackle individual issues or projects.
- Ad-hoc Committees - formed to explore issues. These should be dissolved when the question is answered and, if needed, a full committee (or subcommittee) formed to meet an identified need.

The Executive Committee hopes to have a draft structure of the committees put together in the next few months for Board Review. Teresa Newton said this format is pretty typical of other societies. Such a reorganization will require a change in the by-laws that will need to be voted on by the membership at the next symposium. Thus, it will need to be presented in the December issue of *Ellipsaria* along with any other proposed changes in the by-laws.

Committee Reports

Heidi encouraged committees to be sure to update their pages on the website. Megan Bradley suggested that the committee reports be posted to each committee’s page or at least a blurb. She also suggested that each page contain a picture. Please provide additions and changes to Megan by June 1. She also recommended we verify all links and provide her with changes to those, as well. Rachael Hoch suggested committee chairs consider posting a headshot of themselves on their webpage so individuals can recognize you at meetings.

Symposium – Jeremy Tiemann, Charles Randklev, Diane Waller, Nicoletta Riccardi 2018 Freshwater Mollusk Health and Disease Assessment Workshop

Early registration is over and currently at least 103 registered. Local arrangements for lodging, meals, and transportation are complete, all speakers have been confirmed, and the finishing touches on workshop packets are being made. Subcommittees have been formed for each of the small group sessions. Sponsorships are still coming in and Emily Grossman is tracking the total.

First FMCS International Meeting in Europe, Verbania, Italy, 16-20 Sep 2018.

Registration was opened on January 7. The meeting announcement and the link to the meeting website have been posted on: CNR-ISE, Italian Malacological Society, LIFEWatch and LTER websites. Stimulated by the demands of students from Russia and Brazil, we would like

to try to provide students with financial support. Therefore, to encourage the participation of students, also from other continents, we also asked the Malacological Society of London for help in providing support for travel. We are waiting for their answer.

The account indicated on FMCS website for abstract submission is not working and needs corrected to: fmcseurope2018@ise.cnr.it. Was emphasized that need to continue to work with Megan Bradley as she works well with Sophie to update the website.

Because September is a high tourist month in northern Italy, folks should look for lodging early. Besides hotels, there are several options like apartments, B&Bs, and camping facilities available. To select the most convenient and closest accommodations, search the locations Suna, Pallanza, or Intra. As requested, a list of suitable accommodations was developed for hotels, apartments, camping, etc. (e.g., Booking.com or <https://www.airbnb.it>). These are posted on the website. The Theater Maggiore website is: <https://www.google.it/maps/place/Il+Maggiore+Centro+eventi+multifunzionale/@45.9307928,8.571884,15z/data=!4m5!3m4!1s0x0:0x574fe0fdcc348959!8m2!3d45.9307928!4d8.571884>

Jouni Taskinen made a suggestion we conduct a workshop on parasites during this meeting. Board noted that registration was already in place and, if this is being considered, it needs to be organized quickly. Also, if it is added, make sure to send a notice to those already registered for the meeting.

2019 Symposium

The contract has been signed and the 2019 symposium will take place 14-18 April 2019 at the Hyatt Regency, San Antonio, Texas. Committee chairs have been established and have begun identifying a theme, contacting potential plenary speakers, and establishing special workshops and sessions. The first call for abstracts should be distributed in the September *Ellipsaria*. The Local committee is currently looking for plenary speakers with a southwest vibe and still looking for special workshops. Becca Winterringer suggested we run a question to membership on what they want for workshops. The four ideas previously suggested by the membership were 2-day events. [See 2019 Symposium announcement on Page 16.]

The National Shellfisheries Association and the World Aquaculture Society are having a joint meeting starting on March 7, 2019 in New Orleans. Heidi talked to Ryan Carnegie who indicated they would be hosting a shellfish disease session. She thought it would be a good idea to encourage some folks from this Workshop to attend and incorporate a mix of freshwater talks. Several board members expressed need to intermix the freshwater talks into other sessions and not have a freshwater session. [More details about this joint meeting are presented in the announcement on Page 18.]

Awards – Teresa Newton, Greg Cope, Emy Monroe

As it is a non-symposium year, the Awards Committee has nothing to report on professional awards or student travel awards. For the Regional Meeting Assistance Award Program, thus far in 2018, monetary support has been provided for the Chesapeake Bay Freshwater Mussel Workgroup.

Teresa and Greg announced their resignation from the committee to be effective at the end of the 2019 Symposium. Their plan is to find two new members before the 2019 Symposium who would then take over with Emy as chair for the 2021 symposium.

Nominations – Leroy Koch

No report. Heidi requested everyone to please start thinking about good candidates, especially for President-Elect. [See Call for Nominations on Page 17.]

Outreach – Jennifer Archambault, Kimberly Horndeski

Since the December Board meeting, Co-Chair Jennifer Archambault met with Amy Maynard at the Southeast Atlantic Slope Mollusk Meeting in February and discussed progress on creating infographics. Amy reported that efforts were coming along, but that the National Strategy topics did not seem to fit well with the infographic format. Amy and Anakela Popp planned to try Mollusk 101 topics for infographics moving forward, thinking they may be a better fit for that communication medium.

Co-Chair Kimberly Horndeski is currently looking for any exciting films about mussels that members are willing to share. If you are heading out to the field, or know someone who is, please try to capture the moment to share. Kimberly will also be reaching out to four or five members to have them answer a few questions as part of the film. If you know someone passionate and willing to share a mussel story, please reach out to Kimberly at Kimberly.horndeski@cpa.texas.gov. When sending videos, please send them to kahorndeski@gmail.com, as her work email will not receive large files.

Website updates are ongoing. Please continue to send any information for updates to your committee pages or other web materials to Megan Bradley at megan_bradley@fws.gov.

Gastropod Status and Distribution - Nathan Whelan

Trying to follow-up and conduct names and conservation status assessment updates. Committee still plans to meet during the 2019 Symposium.

Guidelines and Techniques - Ryan Schwegman, Lisie Kitchel

The goal of the committee is to develop consistent best practices for freshwater mollusks. There is a lack of standard practices for surveying, handling, and voucherizing species among different organizations, agencies, and individuals. We want to review and disseminate information regarding guidelines and techniques that minimize harm to freshwater mollusks. The committee has created and continues to maintain a list of mussel survey guidelines and protocols organized by state or government agency on the FMCS website. Additionally, we plan to add photo guideline publications to the FMCS website. Any new information that is available on survey or photo guidelines is welcome and should be forwarded to the committee chairs (rschwegman@enviroscienceinc.com and Lisie.kitchel@wi.gov).

The committee plans to host the 2020 Workshop covering survey techniques and possibly including a state by state guideline overview. We will be forming a small team to spearhead this Workshop effort, and several members expressed interest during the 2017 Symposium. The committee would like to have a field component, so we need warmer climate and someone else to help with location planning. Fall may have more opportunities. Possible Workshop layout will have a day of classroom activities and a day of field activities.

During the last Die-off session at this Workshop, participants were asked to list tasks that they felt needed to be completed as a result of what they had just learned. Heidi gave the committee these lists and tasked them with potentially addressing the issues that have been identified. Examples of such tasks include a decontamination SOP, and asking the folks doing histological studies to put together a You-tube video on preparation of samples.

Lisie said we need to put a call out to state agencies and others for updated protocols.

Environmental Affairs – Steve McMurray, Braven Beaty

FMCS interactions with CASS has been incorporated into the functions of this committee.

Genetics – Kevin Roe, Dave Zanatta

Nothing new to report.

Information Exchange – John Jenkinson, Wendell Haag, Dave Berg

Ellipsaria: The most recent (March 2018) issue of the newsletter was unusually large and varied because of all the submissions made by our officers, committee chairs, other Society members, and non-members who asked for their material to be included. The editor continues to encourage anyone with information about or pertinent to freshwater mollusks to submit short articles or announcements to be posted in *Ellipsaria*. He also welcomes comments about any potential changes to the newsletter that would improve its format and/or usefulness to the members of our Society.

Freshwater Mollusk Biology and Conservation: Tom Watters has rotated off the editorial committee and Greg Cope is due to rotate off next, probably in about six months. The last issue was the largest yet and we are on schedule to get the next issue out in March. Six manuscripts are already on hand for the next issue. Jeremy Tiemann suggested we set a limit on the number of papers and push the overrun to next issue. Wendell did not think this was a problem and would like to keep the rapid turnaround.

The journal is now eligible to apply for Bio-one and that should only be a formality. Author instructions are online. They follow the format of Transactions of American Fisheries Society. This format was specified to Allen Press. There are currently a few minor inconsistencies, so we are trying to work out the details.

The editorial committee would like to hire an hourly employee as an editorial assistant. This person would provide the consistency in formatting that is needed and have final eyes on the papers. Another job would be to deal with Allen Press and passing on invoices for payment, prepare front matter and the table of contents. These duties would take probably less than 5-10 hours a week and could be only 10 hours a month. This would also provide another layer of continuity as editorial board changes. One person suggested was Sherry Bostic by Jim Williams. The Board suggested contacting Jim Williams to see if Sherry is still available and willing, and to determine what her services would cost.

Mussel Status and Distribution – John Harris, Art Bogan

1. Williams, J.D., A.E. Bogan, R.S. Butler, K.S. Cummings, J.T. Garner, J.L. Harris, N.A. Johnson, G.T. Watters. 2017. A revised list of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the continental United States and Canada. *Freshwater Mollusk Biology and Conservation* 20:33–58. A bit of old news but this “names” paper is finally published. This publication covers taxonomy and nomenclatural issues and is an update of Turgeon *et al.* 1998.
2. J. D. Williams *et al.* Conservation assessment of freshwater mussels of US, Canada and Mexico. This revision of Williams *et al.* (1993) is on hold while Williams completes other projects. Going forward, later this spring, action items will include: 1) Request co-author input on a revised methodology for conservation status determinations using the taxonomy adopted in the names manuscript, 2) Update status information for the geographic areas of responsibility to include examination of all the state T&E mussel lists or equivalent documents (e.g.: SGCN - species of greatest conservation need), 3) Revise and update distribution and conservation status information and complete the text revision from the previous submission.
3. Development of Mussel ID App - Susan Oetker. Contracts for use of ESA Section 6 funds provided to Texas have been finalized with the App Developer, and work on the app has resumed in earnest. A new interactive mussel regions map has been constructed and is now functional in the app. Revisions to the app character matrix are complete, and the development team is participating in monthly conference calls to review progress and provide guidance to complete the app.

4. Atlas of Freshwater Mussels of North America. Currently, 151 of the approximately 356 taxa addressed in the Atlas have volunteer authors for species accounts. We have received 27 first draft accounts as of March 6, 2018. One species account is posted to the website. We are working diligently to clear the backlog of preliminary reviews of the remaining 26 draft species accounts so they can be sent to external reviewers. Accounts will be posted as they are completed.

Propagation, Restoration, and Introduction – Rachael Hoch, Nathan Eckert, Tim Lane

Nathan Eckert stepped down as co-chair at the end of 2017. We wish to thank Nathan for his willingness to co-chair the committee up to this point. Rachael and Tim will continue to co-chair the committee moving forward.

The committee continues to maintain a contact database for all mollusk propagation facilities active in FMCS. Any facilities actively propagating freshwater mollusks are encouraged to contact Rachael to add their contact information to the facilities database. The updated list will be made available on the FMCS website.

The committee plans to update the propagation and restoration activities summary this spring. Tim wants to send out an augmentation questionnaire. Heidi said the resulting information should be open access.

The committee also continues to maintain a society-wide propagation/stocking/relocation database. A format has been developed for the database, and facilities will be asked to send their information to Tim by fall 2018 to keep it updated and available for interested FMCS members.

The committee is continuing work on an annotated bibliography to help guide best management practices for the following restoration and propagation related activities: (1) propagation, (2) translocation and handling, (3) quarantine and biosecurity, (4) health and disease, (5) restoration planning, and (6) genetic guidelines. A number of committee members with experience and expertise in these particular activities have agreed to assist in this undertaking.

We are excited to report that an extremely useful book/manual pertaining to our committee's propagation focus has been published and is available for purchase: *Freshwater Mussel Propagation for Restoration*, Cambridge University Press 2018, by Matthew A. Patterson, Rachel A Mair, Nathan L Eckert, Catherine M Gatenby, Tony Brady, Jess W Jones, Bryan R Simmons, Julie L Devers, and Chris Barnhart.

Tim will send out to committee a template of augmentation data from the Virginia Aquatic Wildlife Conservation Center and hopes that all other propagation facilities will provide similar information. We would like to prepare a GIS layer at HUC 8 level that allows the user to hover over an area and show what species are being worked on.

Ad hoc committees

International – Arthur Bogan, Manuel Lopes-Lima

The first FMCS International meeting was announced in the March issue of *Ellipsaria*, page 17 to be held in Verbania, Italy 16-20 September 2018. The theme for the meeting is "Bridging the gap between freshwater mussel research and conservation in the Old and New Worlds. Abstract and early registration will close 30 April 2018. [See updated details in the article on Page 14.]

We will continue the discussion of possible use of chapters for each of the major international regions, beginning with Europe. We will use the comments and suggestions from the FMCS Chapter Committee to initiate discussions on developing the European Chapter during the International Meeting this September in Italy.

Professional Development -Becca Winterringer, Amanda Rosenberg

The Committee held a conference call with the FMCS Executive Committee on March 8, 2018, to discuss the survey poll results and strategy moving forward with developing an education-based Professional Certification program administered by the FMCS. Participants included committee members Becca Winterringer and Amanda Rosenberger (co-chairs) and Greg Zimmerman. FMCS Executives included Janet Clayton, Heidi Dunn, Jeremy Tiemann, and Teresa Newton.

Action Items

- Should we move forward with exploring a Certification Program? – Yes.
 - Action item: Develop a one-page flyer for FMCS Board review and approval. Ultimately this flyer will be distributed to membership. The flyer should outline the mission, purpose and overview. The goal is to put this item on the FMCS ballot in the fall/winter and announce the results in Texas.
- Membership Survey – Identify tiers, levels, and naming, fees to go to student, workshops, continuing education (CE) events, implement ways to support those who cannot attend CE events.
- The American Fisheries Society (AFS) probably would be amenable to a certification partnership so that we could have an abbreviated version or a specialty program that aligns with their current certification program. This was determined not to be an acceptable choice by the Executive Committee.
 - Ask AFS how they manage the application process. Where do fees go? How do they define “continuing education” and how is that tracked?
 - Becca has a call in to ask these questions. Jeremy Tiemann has offered to help.
- Amanda Rosenberg is to pursue AFS certification and will provide input on process for use in certification process we are developing.

Results of the membership survey indicated a general support for the program: 100 people participated in the survey, with 86% being current members, 7% past members, and 7% non-members. 75% of the respondents were members of other organizations. 60% of the non-members thought the program would encourage new members. Overall, 72% said they would benefit from the certification, and 75% said that it would increase interest in FMCS.

An example of the program flyer was presented to the Board. Lisie Kitchel was concerned that the draft flyer sounded like we already had the program. Becca is to take the suggestions from the Board meeting back to her committee and send a revised draft flyer out to Board for edits and comments to be back to Becca by June 1. The goal is to be ready to put the flyer in the September issue of *Ellipsaria*.

The committee talked to AFS's Lauran Mauza and asked if the FMCS program could model the AFS program. She advised that she would need to talk AFS. AFS is currently looking to see how many states provide merit raises based on certification.

John Jenkinson questioned what the fees would be used for and Becca responded that they would be used to provide developmental opportunities for students and provide workshops, etc. John also questioned whether there would be any administrative costs that could be paid for. Heidi said that could be a possibility in the future but should try volunteers first; the AFS review panel is currently all volunteers.

Heidi Dunn made a motion that the Society go forward with pursuing the development of a certification program. Lisie Kitchel seconded. All approved. The target is September *Ellipsaria* for publishing the flyer for a membership vote to follow at the 2019 Symposium.

Chapters - Greg Cope, Celeste Mazzacano, Art Bogan

Greg talked to Greg Schieffer, Executive Director of SETAC, and also AFS to get their standard operating procedures for establishing and running chapters. One key decision that needs addressed is whether or not the parent society would collect dues that would then disseminate to chapters. Chapters typically are standalone bodies. They are incorporated separately, such that they have their own by-laws, hold their own elections, etc. but are affiliated with the larger organization. How can the larger organization facilitate the chapter activities? He noted that the AFS parent society has meeting insurance, and chapters can buy into that policy. SETAC may be a better model because they are based on regional divisions compared to AFS state chapters. FMCS is more geographically or faunal related. Celeste noted that one member of each chapter generally represents that chapter to the Society Board. Chapter officers are required to be members of the parent society while members of the chapters are not required to be members of the parent society but that is encouraged. There would be a regional chapter committee that needs to be formed that would oversee the chapters. The president of chapters would have a bi-annual meeting at Symposiums and have a chapter meeting to discuss cross-chapter activities and share ideas. President of division would be member of Excom. Jeremy Tiemann indicated that the division levels of the AFS may be more similar to the FMCS regional groups such as Ohio River Basin, UMRCC, etc. Relates to groups already out there or formation of others. Each chapter would need to formally organize and would need to develop a minimum structure that would be needed for inclusion in the by-laws. They would pass on recommendations to the Board for inclusion of chapters. International chapters could be formed the same way (example FMCS Europe, FMCS Asia, etc.). Needs to be brought forward for vote by members, as would require the formation of a new standing committee.

Lisie Kitchel wanted assurance that the smaller groups out there would not be discouraged if they didn't want to formally organize.

Greg Cope made motion to proceed with the development of chapters for FMCS. Heidi Dunn seconded. All approved.

Heidi requested the names of heads of regional groups. Greg is to solicit names of people to contact to work on this. Need to contact some folks from regional groups, those in Europe, and others to work on the details on what will work for everyone. Nicoletta Riccardi suggested discussing it up with the Europeans at the Italy meeting to determine their wishes with regard to chapter development. [See Regional Mussel Group request on Page 17.]

Monetary Values of Mollusks – Megan Bradley

We are now reviewing the process from last monetary values book and trying to get ahead of next revision. Committee is to meet at Genoa tomorrow.

Ecosystem Services – Carla Atkinson

Nothing to report.

Diversity and Inclusiveness Committee – Tamara Smith

Ad-hoc Committee: Tamara Smith (USFWS - MN WI Field Office, Ad Hoc Chair), Jeremy Tiemann (INHS), Brooke Penaluna (USFS - PNW Research Station), Kimberly Horndeski (TXCPA), and Neil Ford (University of Texas - Tyler)

This committee held their second meeting on February 16, 2018, to gain some insights from August Ball, Cream City Conservation, who joined our conference call. Jeremy had a chance to see August present a talk at the Midwest Fish and Wildlife Conference in late January and thought she would be a good resource. August was an excellent person to connect with and the discussion left us with a lot of good ideas!

Initial Committee Tasks:

- Develop clear goals and objectives for the group.
 - Progress: The group has begun to draft a plan with goals, objectives, and actions.
- Develop an optional demographic questionnaire to FMCS members to get baseline data to help us identify needs or areas of concern and to help measure our success.
 - Progress: This idea was brought up to the Board during the December 2017 conference call and the Board approved the idea.
 - The committee has started a draft questionnaire.
 - We also spoke with Sophie Binder, the FMCS webmaster, about the logistics of the questionnaire.
- Show photos of people on the website. Ask folks to submit a photo of them and a quote to be featured on the website! (For example, ask “In a sentence or two, tell us why you are a member of FMCS?”) Talk to our webmaster about getting a slide show of member photos and quotes on the website front-page.
- Create an ad-hoc committee presence on the FMCS website. The committee would work to develop language.
- Explore the idea of having a diversity & inclusion speaker at the 2019 Symposium.
- Explore ways to welcome new members.

The Committee plans to meet via conference calls and to work on a draft plan, questionnaire, etc. together on Google Drive.

Heidi Dunn made motion to adjourn and Wendell Haag provided a second.

Respectfully Submitted
Janet L. Clayton, Secretary

The First FMCS International Meeting in Europe is Approaching!



This is a reminder that the first Freshwater Mollusk Conservation Society International meeting outside of the USA will occur on September 16-20, 2018, at the Teatro Maggiore in the beautiful town of Verbania, Italy. It is not too late to register for this Meeting (at https://molluskconservation.org/EVENTS/2018-INTNL/2018_FMCS-INTNLMeet.html). Also,

the **abstract submission deadline** for this Meeting has been extended to **June, 30**. So hurry and submit your abstract at: <https://www.lagomaggiorediscovery.it/>.

All students should register as soon as possible in order to get their abstracts accepted and to apply for travel grants available from the Malacological Society of London (see rules at <http://malacsoc.org.uk/awards-and-grants/travel-grants/>) and the FMCS [see the Meeting website (https://molluskconservation.org/EVENTS/2018-INTNL/2018_FMCS-INTNLMeet.html) for details on how to apply].

Initiatives:

We are preparing an agenda that will be discussed as part of the proposed Meeting with the following items:

1. A European Chapter will be proposed for the FMCS to address all issues related to the conservation of molluscs in Europe. We will propose key people from all regions of Europe that are interested and willing.
2. A European strategy for the conservation of freshwater bivalves to be published in the FMCS journal and try to promote a first review paper on the conservation of European sphaeriids and freshwater gastropods.
3. A Horizon scanning review document on the emerging issues for the conservation of freshwater bivalves.
4. Promote a series of Conservation Evidence papers for propagation and habitat restoration methods for freshwater mussels.

Additional information:

- Please reserve lodging early, as this is a popular time of year in Italy.
- We will also announce soon the addition of a special issue for the Meeting's contributions.
- Please **consider sponsoring this important Meeting**. See the Meeting website (https://molluskconservation.org/EVENTS/2018-INTNL/2018_FMCS-INTNLMeet.html) for ways to do so.
- You can share social moments at this Meeting with your family/friends. **Accompanying persons are welcome** at all social and relaxing moments of this Meeting; we only ask you to pay a fee of 130 euros to cover the costs of food and drinks provided for your accompanying persons during the lunches, the morning and afternoon coffee breaks, and the welcome party on the evening of September 16.

So, for all of the above reasons, it is extremely important that you attend. We know that other meetings and workshops are presented every year but this one will be of special interest for years to come. Help us make this meeting a success and firmly establish the Freshwater Mollusk Conservation Society on the European continent.

WE LOOK FORWARD TO SEEING YOU IN VERBANIA!

FMCS to Support Student Participation at the 2018 International Freshwater Mollusk Meeting in Italy

The FMCS Awards Committee has allocated \$4,000 for student travel to participate at the 2018 International Freshwater Mollusk Meeting this September in Verbania, Italy. The Local Committee will use a selection process similar to that used for previous FMCS symposia and the undergraduate and/or graduate students selected for awards will receive paid lodging for

the duration of the meeting at a specific hotel. We hope these awards will encourage student participation at the international meeting. Interested students should see the Verbania Meeting page on the FMCS website (https://molluskconservation.org/EVENTS/2018-INTNL/2018_FMCS-INTNLMeet.html) for details on how to apply.

Planning is Well Underway for Our 2019 Symposium in San Antonio, Texas

The 11th Biennial FMCS Symposium will be held on April 14 -18, 2019, at the Hyatt Regency San Antonio Riverwalk, in San Antonio, Texas, USA. The Planning Committee is pleased to announce that our conference theme will be: **Life on the Edge: reconciling human needs and freshwater mollusk conservation**. The goal for this symposium is to focus on how humans and freshwater systems can coexist to ensure the long-term persistence of freshwater mollusks. This issue represents a formidable challenge, particularly in the Southwestern United States where population growth combined with a changing climate is expected to increase human demand for water and, as a result, exacerbate water quantity and quality issues.

This Symposium will bring together regulators, researchers, consultants, and enthusiasts in a forum that will allow for collaboration opportunities and information exchange. We are organizing several plenary sessions, including 1) Mollusk conservation in the Southwestern United States; and 2) Sustainable water management and its role in mollusk conservation. Internationally recognized speakers will present the state of current research on these topics. More details on additional sessions will be provided on our page on the FMCS website (https://molluskconservation.org/EVENTS/2019SYMPORIUM/2019_FMCS-Symposium_INTRO.html) in the coming months

The Symposium rate for hotel rooms at the Hyatt will be \$149/night for a double-room. Much more information regarding travel, accommodations, registration, and the Symposium agenda also will be posted on the 2019 FMCS Symposium page as it develops. Much of this information also will be presented in the September issue of *Ellipsaria*.



First Call for Abstracts 2019 Biennial FMCS Symposium, San Antonio, Texas, April 14 – 18, 2019

The abstract submission deadline for the 2019 FMCS Symposium will be **Friday January 4, 2019**. 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.

Abstracts for both the posters and the oral presentations are limited to 300 words. The title of the abstract 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). An example abstract has been posted on the 2019 Symposium page on the FMCS website: https://molluskconservation.org/EVENTS/2019SYMPOSIUM/2019_FMCS-Symposium_INTRO.html. At the bottom of the abstract, please indicate your preference of oral or poster presentation, and if you would be willing to switch formats. Submit your abstract using this form: <https://irnrfm.tamu.edu/fmi/webd/FreshwaterMolluskConservation>.

FMCS OFFICER NOMINATIONS FOR 2019

We are now seeking nominees for **President-Elect**, **Secretary**, and **Treasurer** of our Society. Each position is for a period of two years. These positions will take office during the FMCS Symposium in San Antonio, Texas, in April 2019.

Any member may nominate any other member. Nominees must be current FMCS members in good standing and who agree to be nominated. Please consider yourself or another worthy member for these positions. This is a great opportunity to serve in the FMCS.

The Nominations Committee will select the two candidates willing to run for each office who receive the most nominations for that office. We anticipate that position statements from the candidates will be posted in the December issue of *Ellipsaria*, and on the FMCS website in January 2019; and that voting will also be done on the FMCS website.

Send your nominations to: Leroy Koch, either by e-mail at Leroy.Koch@fws.gov or by surface mail at U.S. Fish and Wildlife Service, J.C. Watts Federal Building, Room 265, 330 West Broadway, Frankfort, Kentucky 40601. If you have any questions, feel free to contact Leroy by email or call him at 502-695-0468 ext. 106. **The deadline for nominations is October 5, 2018.**

Attention Regional Mussel Groups !

The FMCS Board recently voted to establish an ad hoc committee to develop a framework for the recognition of regional/watershed chapters to be affiliates of our Society. We are thinking that most North America chapters would be established by existing watershed or state mussel groups that want a more formal affiliation with FMCS. International chapters could be formed for the same reason, perhaps by geographical area, for example: FMCS Europe, FMCS Asia, etc.

The ad hoc Committee members, Greg Cope, Celeste Mazzacano, and Art Bogan, have compiled some information from other Societies that could be used as a starting point. What we need now is some interested folks to review the draft framework and develop something that would work for FMCS. The committee would establish a minimum chapter structure that would be included in our by-laws and some guidelines that informal groups would use to form their chapters.

We are currently in the process of identifying: 1) groups that might want to pursue being a chapter of FMCS, and 2) individuals who would be willing to serve on the ad hoc committee to form the framework for chapter designation. THIS IS YOUR CHANCE TO CONTRIBUTE. Please contact Heidi Dunn at Hdunn@ecoanalysts.com if you are interested in being on the committee and/or your mussel group would be interested in forming a chapter. She and the ad-hoc committee look forward to hearing from you.

Changes in FMCS Dues Schedule

The membership has expressed a desire to have a Lifetime Membership category in our dues offerings and, also, to give a discount to retired members. During its March 2018 Meeting, the FMCS Board voted in a new dues schedule.

Old Schedule

- Student \$40/2 years
- Regular \$80/2 years
- Contributing \$250/2 years

New Schedule

- Student/Retiree \$40/2 years (retiree is anyone who has retired from a career position)
- Regular \$80/2 years
- Contributing \$250/2 years
- Lifetime \$800 (onetime payment)

The new dues schedule will be implemented starting for 2019 (active on November 1, 2018, and available with registration for the 2019 Symposium).

Announcements

Marian E. Havlik, the Upper Mississippi “Clam Lady,” Has Passed Away

In 2015, at our Symposium in St. Charles, Missouri, Marian Havlik was telling folks that she would be moving to Florida soon to be closer to her family. Recently, word has come from John Slapcinsky at the Florida Museum of Natural History that Marian has passed away and her collection, field notes, and maps have been donated to the Museum. More details will be posted here when they become available. Until then, those of us who knew Marian during her active years while living in La Crosse, Wisconsin, will simply have to remember fondly her tenacity concerning the protection of Midwestern native mussels, especially the federal endangered Higgins Eye, *Lampsilis higginsi*.



Another Chance to Talk About Mollusk Health Issues

Aquaculture 2019, March 7-11, 2019, at the New Orleans Marriot, New Orleans, Louisiana, USA, will be the next triennial meeting of the World Aquaculture Society, the Fish Culture Section of the American Fisheries Society, and the National Shellfisheries Association (NSA). Over 3,000 people attended the last triennial in the United States (2016 in Las Vegas) and the New Orleans meeting is expected to be at least as large. Ryan Carnegie is organizing a session on mollusc health and is encouraging submissions from the freshwater mussel community, which has long had a presence at NSA conferences. Ryan is interested in expanding engagement between the freshwater and marine mollusc communities. He would like to use the session to highlight common challenges faced by species in these two realms and by those studying and managing these issues—many of which have unresolved or uncertain bases.

The abstract deadline for Aquaculture 2019 is **August 31, 2018**. Check out the meeting website (<https://www.was.org/meetings/pdf/AQ2019RegBro.pdf>) and keep your eyes open for an email when more information becomes available.

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 each 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.

12th Annual Meeting of the Virginia Atlantic Slope Mollusk Recovery Group

On March 29, 2018, Brian Watson (Virginia Department of Game and Inland Fisheries -DGIF) convened the 12th annual meeting of the Virginia Atlantic Slope Mollusk Recovery Group in Verona, Virginia. This group was formed in 2006 to discuss and address conservation and recovery issues pertaining to freshwater mollusks in Virginia's Atlantic Slope waterways and is comprised of members from the Virginia Department of Game and Inland Fisheries, U.S. Fish and Wildlife Service (FWS), Virginia Department of Conservation and Recreation's Heritage Program (DCR), Virginia Tech (VT), The Nature Conservancy (TNC), U.S. Forest Service, private consultants, and other universities and non-governmental organizations. Fifteen people attended the meeting in person, while 14 people participated by phone and thru GoToMeeting.

The morning session included updates on several topics: propagation at the Virginia Fisheries and Aquatic Wildlife Center (VFAWC) at Harrison Lake National Fish Hatchery and the Freshwater Mollusk Conservation Center (FMCC) at Virginia Tech, the DuPont/South River NRDAR settlement, proposed ammonia water quality standards, James spiny-mussel projects at VA Commonwealth University (VCU), and genetics assessment of alewife floater and yellow lampmussel.

- In 2017, the VFAWC propagated over 1.1 million juvenile mussels from 8 species and released over 45,000 tagged mussels in the 6 waterways. VFAWC also provided over 288K mussels of 6 species to universities, agencies and labs for toxicology and grow-out work. The FMCC continued annual streamside infestations with the endangered James spiny-mussel (*Parvaspina collina*; JSM) as part of a FWS Biological Opinion with the Virginia Department of Transportation (VDOT), releasing nearly 200 infested cyprinids to Craig Creek and Johns Creek, Craig County.
 - The DuPont Natural Resource Damage Assessment and Restoration case was settled in December of 2017 with \$4 million awarded for mussel restoration. These funds will be distributed to VFAWC and FMCC and work will begin in 2018 and continue for about 10-11 years and occur throughout the upper South Fork River watershed.
 - Proposed EPA ammonia water quality standards have not been adopted by the Virginia Department of Environmental Quality (VDEQ), and a number of bills were passed during the 2018 legislative session delaying VDEQ from adopting these new standards until additional information is provided to
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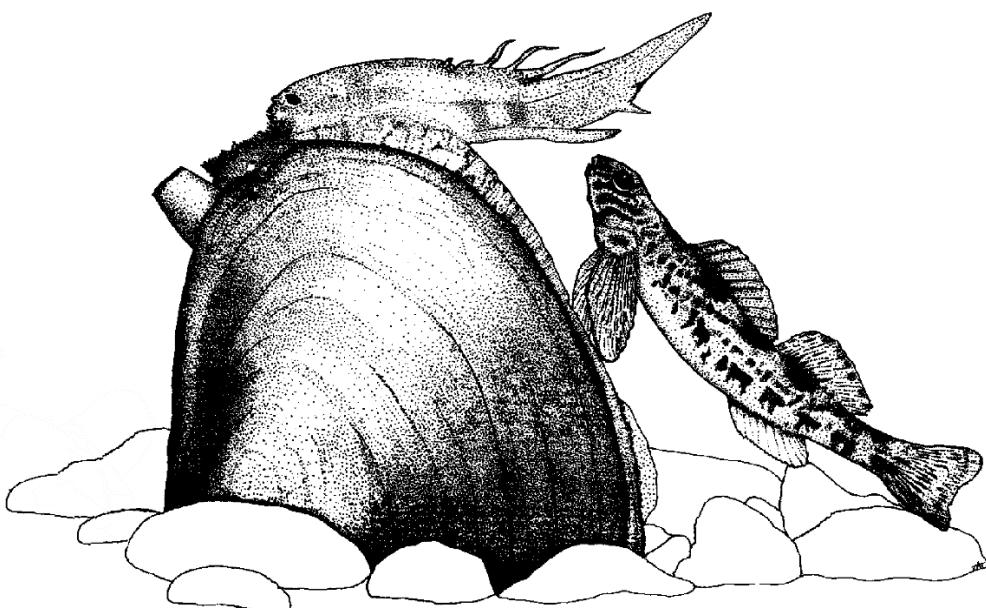
the state legislature. The reason is financial hardship on localities due to WWTP upgrades. These bills are expected to be signed by the Governor. Water Quality Improvement Funds are being directed towards localities not in compliance with the new ammonia standards and looking to upgrade facilities. The issue is supposed to be reviewed again in fall 2018.

- Bonnie Roderique, graduate student at VCU, updated the MRG on her JSM eDNA and habitat modeling projects. VDOT funded the eDNA project in hopes of being able to detect the presence of JSM as part of their project reviews. Further work needs to be done to utilize eDNA for JSM and this work may start in 2018 if VDOT opts to fund a second round of research. Bonnie also is starting a JSM population genetic assessment in 2018 with the objectives being to determine genetic structure, gene flow, isolation of known populations and to identify ideal broodstock locations.
- DGIF is funding genetic assessments of alewife floater and yellow lampmussel in Virginia to identify ideal broodstock locations and if populations can be mixed between river basins. Work is being conducted by VT and expected to be completed by the summer of 2018.

The afternoon session started with Sean Sterrett, UMass, providing an update on the brook floater range-wide conservation initiative. Major objectives include developing standardized survey and monitoring protocols, developing propagation techniques and identifying release sites, and developing of education and outreach materials. Dr. Michael Gangloff, Appalachian State University, reviewed his *Elliptio* phylogeny project. The current focus is lanceolate *Elliptio* species but work with the more problematic *complanata* complex is underway.

The meeting continued with a review of significant mussel surveys in 2017, including Conservation Management Institute, VT, surveys in the New River as part of the Fries Dam relicensing; DCR surveys in Tye River for JSM; DGIF and DCR long-term mark-recapture surveys at seven sites across the Piedmont; and Environmental Solutions and Innovations, Inc., mussel surveys and relocations in the New River as part of the I-81 bridge replacement, and surveys and relocations for the Atlantic Coast and Mountain Valley Pipelines.

For more information about this or future meetings of this group, contact Brian Watson at brian.watson@dgif.virginia.gov or (434) 525-7522, x 114.



Upcoming Meetings

June 19 – 22, 2018 Joint American Malacological Society 84th Annual Meeting and Western Society of Malacologists 51st Annual Meeting, Hilton Waikiki Beach Hotel, Honolulu, Hawaii, USA
<http://www.malacological.org>

July 21 – 26, 2018 Society for Conservation Biology North American Sectional Meeting, Westin Harbour Castle Conference Centre, Toronto, Ontario, Canada. Theme *Conservation Science, Policy, and Practice: Connecting the Urban to the Wild* <http://conbio.org/groups/sections/north-america/meetings/>

August 19 – 23, 2018 – American Fisheries Society 148th Annual Meeting, Atlantic City, New Jersey, USA Theme: *Communicating the Science of Fisheries Conservation to Diverse Audiences*
<http://fisheries.org/events-page/future-afs-meetings/>

September 2 – 6, 2018 – 8th International Symposium on Aquatic Animal Health, Charlottetown, Prince Edward Island, Canada Theme: *Biotechnology in the Advancement of Aquatic Animal Health*
<https://isaah2018.com/>

September 16 – 20, 2018 – First FMCS International Freshwater Mollusk Meeting, Theater Maggiore Verbania, Italy, Theme: *Bridging the gap between freshwater mollusk research and conservation in the Old and New Worlds* https://molluskconservation.org/EVENTS/2018-INTNL/2018_FMCS-INTNLMeet.html

October 21 – 24, 2018 – Southeastern Association of Fish and Wildlife Agencies 72nd Annual Conference, Renaissance Riverview Plaza Hotel, Mobile, Alabama, USA.
<http://www.seafwa.org/conference/overview/>

November 27 – 29, 2018 – International Seminar: Monitoring and Restoration of Freshwater (mussel) Habitats, Clervaux, Luxembourg. <http://www.unio.lu/aktuelles/news/international-seminar-monitoring-and-restoration-o/>

March 7 – 11, 2019 – National Shellfisheries Association and World Aquaculture Society joint meeting, New Orleans Marriott, New Orleans, Louisiana, USA. Theme: *Aquaculture – The Big Easy Choice!*
<https://www.was.org/meetings/pdf/AQ2019RegBro.pdf>

April 14 – 18, 2019 – FMCS 11th Biennial Symposium, Hyatt Regency, San Antonio, Texas, USA. Theme: *Life on the Edge: Reconciling River Management*. Other details not yet announced.

May, ??-??, 2019 Society for Freshwater Science Annual Meeting, [Dates, location, and theme not yet posted] <http://sfsannualmeeting.org/>

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.

Brooding *Quadrula fragosa* Behaviors and Interactions with Fishes

Mark Hove¹, Michelle Bartsch², Briana Burke¹, Alex Franzen¹, Diane Waller², Nathan Eckert³, Megan Bradley³, Tamara Smith⁴, Mike Davis⁵, Bernard Sietman⁵, Byron Karns⁶, Robert Whaley⁶, and Allison Holdhusen⁷

¹ University of Minnesota, 2003 Upper Buford Circle, St. Paul, Minnesota 55108

² U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, Wisconsin 54603

³ U.S. Fish and Wildlife Service, Genoa National Fish Hatchery, Genoa, Wisconsin 54632

⁴ U.S. Fish and Wildlife Service, Minnesota-Wisconsin Field Office, 4101 American Boulevard East, Bloomington, Minnesota 55425

⁵ Minnesota Department of Natural Resources, Center for Aquatic Mollusk Programs, 2109 North Lakeshore Drive, Lake City, Minnesota 55041

⁶ National Park Service, St. Croix National Scenic Riverway, 401 North Hamilton Street, St. Croix Falls, Wisconsin, 54024

⁷ National Park Service, Mississippi National River and Recreation Area, 120 Kellogg Boulevard West, St. Paul, Minnesota 55101

Over the past 15 years, members of the multi-institutional Upper Mississippi River Conservation Committee's Mussel Coordination Team (MCT) have been working to conserve rare species, including the federally endangered Winged Mapleleaf, *Quadrula fragosa*. Recently, MCT members studied brooding behavior of *Q. fragosa* while collecting glochidia for juvenile propagation efforts. We checked mussels in a central reach of the St. Croix River one to three times per week between August 31 and October 3, 2016, and between August 25 and September 15, 2017. We used the presence of an expanded excurrent aperture holding a bolus of glochidia (a "mantle magazine," per Barnhart et al., 2008, Hove et al., 2012) to identify brooding animals.

Quadrula fragosa also were videoed within the lower St. Croix River between September 8 and 18, 2016, and between August 13 and September 29, 2017. Video was recorded for between four and 13 hours per night, on one to three nights per week. During 2017, we also placed bait upstream of displaying *Q. fragosa* in hopes of luring the primary glochidial host in this region, Channel Catfish, *Ictalurus punctatus*, to interact with the mussels. The mantle displays of quadruline mussels, including *Q. fragosa*, are presumed to elicit attacks by host fish as a glochidia transfer mechanism (Sietman et al., 2012), but those attacks have rarely been observed (Barnhart et al., 2008).

We observed interactions between brooding *Q. fragosa* and co-occurring fishes on only two occasions. During the night of September 20-21, 2017, some *I. punctatus* appeared to touch magazines with their barbels, but no feeding behavior was observed. At 8 am on September 21, a Shorthead Redhorse, *Moxostoma macrolepidotum*, [not a suitable host (Hove et al., 2012)], began to feed on a fully inflated *Q. fragosa* magazine (Figures 1a and 1b). It appeared that glochidia were drawn from the magazine as a white 'mist' surrounded the mouth of the *M. macrolepidotum* (Figure 1c). After 40 seconds, an *I. punctatus* displaced the *M. macrolepidotum* towards the camera and appeared to bite down on the magazine twice (Figure 1d). The *M. macrolepidotum* returned to the *Q. fragosa* to repeatedly feed on the magazine area for 3.3 minutes, after which the mantle tissue appeared lighter in color (Figure 1e), similar to two individuals described in Sietman et al., (2012). That mussel soon buried into the substrate. A few days later, we observed a *M. macrolepidotum* bite down once on a partially inflated magazine (Figure 1f).

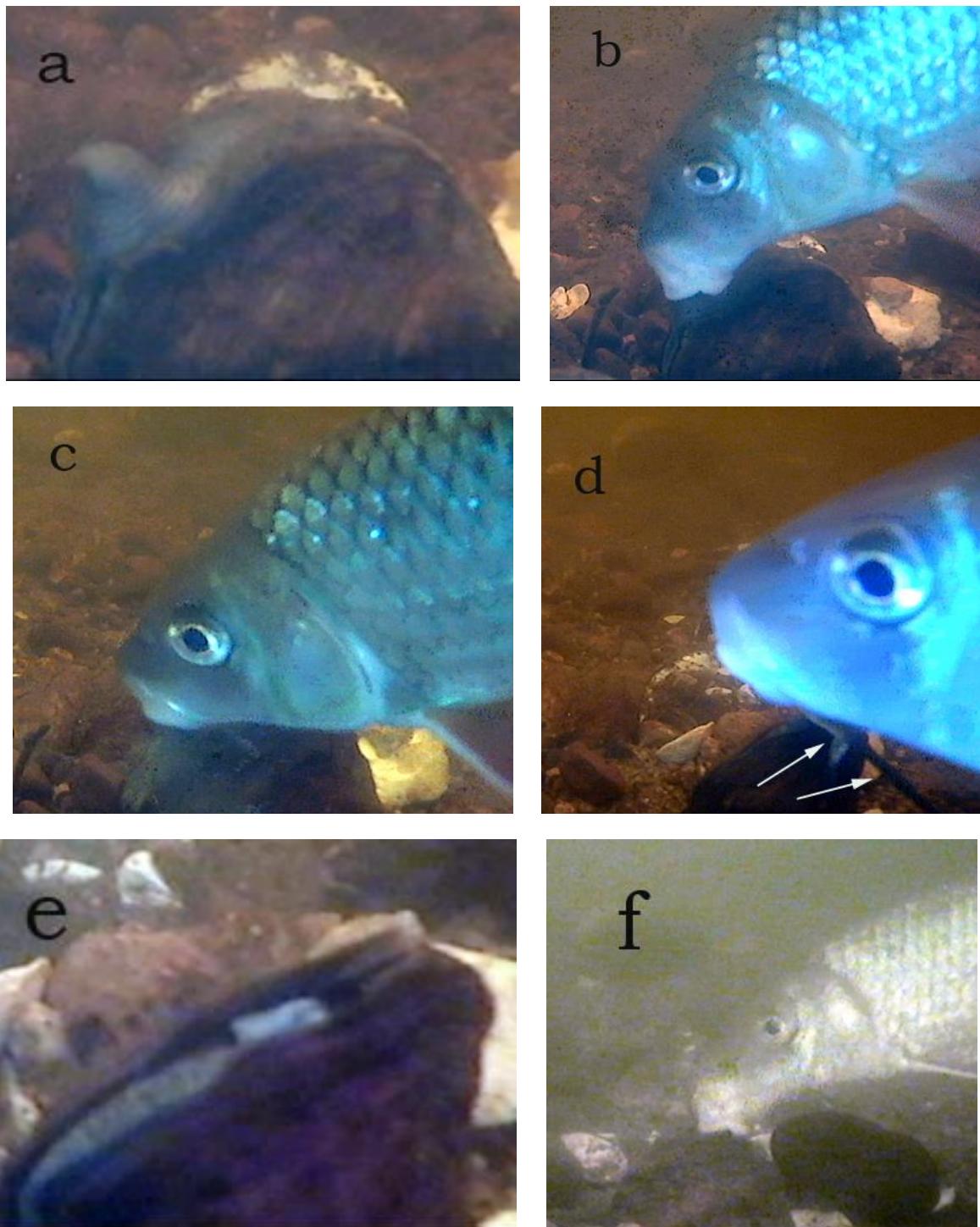


Figure 1. Brooding *Q. fragosa* and interactions with co-occurring fishes: a) fully inflated mantle magazine (12-20 mm magazine height) with broad mantle drapes around the magazine, b) *M. macrolepidotum* begins to feed on fully inflated magazine, c) *M. macrolepidotum* feeding on magazine. Note misty cloud of presumed glochidia below fish's mouth. d) an *I. punctatus* [only visible as the white and black barbels (at white arrows) below the *M. macrolepidotum*] joins feeding on the magazine. e) *Q. fragosa* after *M. macrolepidotum* and *I. punctatus* feeding, and f) *M. macrolepidotum* feeding on a partially inflated *Q. fragosa* magazine.

During our observations, we found that *Q. fragosa* with partially inflated magazines were more reactive to disturbance than those with fully inflated magazines. *Quadrula fragosa* with minor or partially-inflated magazines (Figures 2a and 2b, respectively) nearly always drew their magazine in and closed their valves in response to a minor disturbance such as a dimming video camera light or the passage of a fish's shadow over a large portion of the mantle. *Quadrula fragosa* with full magazine displays; however, did not appear to withdraw in response to these minor disturbances, or when divers removed them from the substrate, or even when briefly held above the water surface.

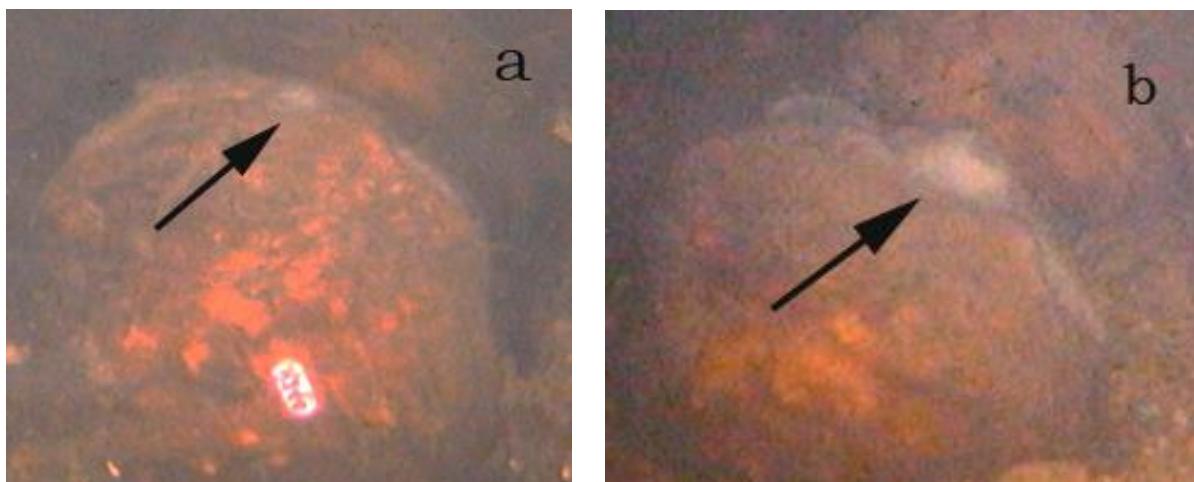


Figure 2. Mantle magazines of brooding *Q. fragosa* in varying degrees of inflation: a) minor inflation (1-2 mm magazine height), and b) partial inflation (9-15 mm magazine height).

In general, the brooding *Q. fragosa* we observed seemed to move very little. Some mussels rotated slightly (2-4 mm) every 30-90 minutes, changing the orientation of their magazine towards or away from the riverbed. Occasionally, mussels rocked back and forth, raising or lowering themselves in the substrate; opened or closed their valves slightly; or slowly pulsed their mantles. On one occasion, a female with a full mantle display released most of the magazine contents even though no fish were visible nearby. While this event was not captured on video, it was similar to a release photographed in the laboratory (Figure 3).

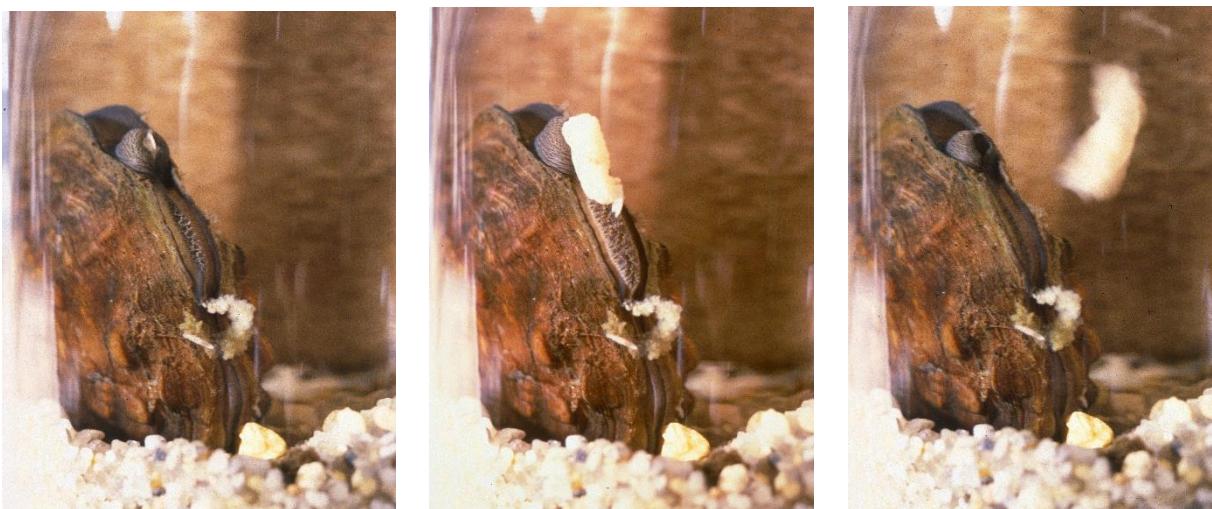


Figure 3. From left to right, a series of picture showing a *Q. fragosa* releasing many conglutinates in a laboratory beaker.

Displaying female *Q. fragosa* in the central St. Croix River also appeared to respond to elevated river discharge. During fall 2016, females began displaying magazines in late August but stopped for a week when river discharge doubled (Figure 4). Magazines were re-extended on September 19 and continued through September 26.

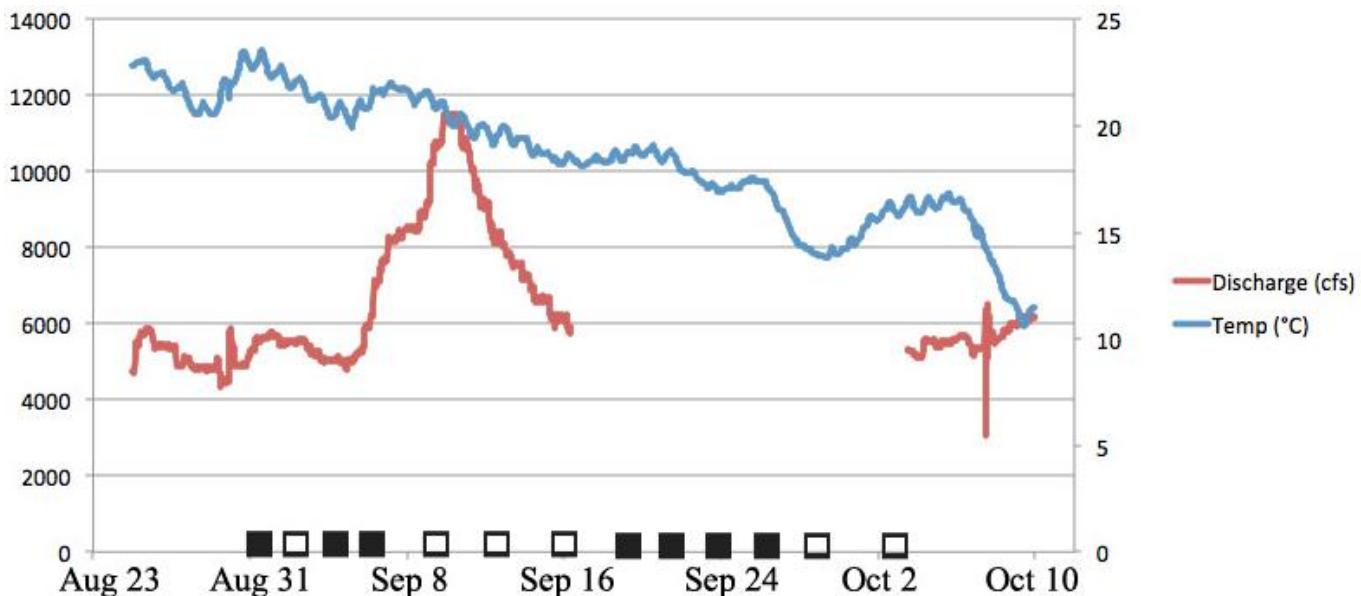


Figure 4. Water temperature and river discharge values during the *Quadrula fragosa* display period in 2016. Filled boxes indicate times when displaying mussels were observed and clear boxes represent times when no mussels were found to be displaying. [The USGS St. Croix Falls, Wisconsin, gaging station (#05340500) did not record discharge between September 15 and October 3, 2016.]

Although we observed two instances of fishes striking *Q. fragosa* mantle magazines, those were rare events. Most *I. punctatus* passed by brooding mussels without interacting with them. Capturing the fish-mussel interactions that we did see on video required two seasons of observation and \approx 100 hours of video recording.

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Further Observations on Secondary Papillae on Margaritiferidae

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Recently, a presumed new anatomical character for the family Margaritiferidae was discussed and illustrated for two species of North American *Margaritifera* (Bogan et al. 2018). Here, we examine additional information on secondary papillae in *Margaritifera dahurica* (Middendorff, 1850) from far eastern Russia.

Bogatov et al. (2003: Figure 1E) noted *Margaritifera* possess “small pailliform knobs” on the external edges of the exhalent siphons and illustrated them for one species. They used these small knobs in two places in their key (Bogatov et al. 2003). While describing the new species, *Dahurinaia transbaicalica*, Klishko figured the secondary papillae along the excurrent and incurrent apertures (Klishko, 2008: Figures. 4e-g). Later, Klishko (2014) revised the Margaritiferidae of the Amur River basin collapsing five Comparative Species into a single species, *Margaritifera dahurica*. The secondary papillae along the incurrent aperture were figured, but not discussed (Klishko 2014: Figure 5i).

In Figure 1, we provide images of the apertures of *M. dahurica* from the Ingoda and Onon rivers and Arey Lake. The Ingoda and Onon rivers come together to form the Shilka River in Zabaykalsky Krai, a tributary of the Amur River of eastern Russia. These pictures of live specimens of *M. dahurica* illustrate Type 1 secondary papillae at the base of the arborescent papillae on the external surface of the mantle adjacent to the incurrent aperture (Figure 1G). The figures also show the arborescent [primary] papillae on the incurrent aperture (Figures 1A-F, G) and Type 2 secondary papillae on the external surface of the mantle adjacent to the incurrent and excurrent apertures (Figures 1A-D, E). Type 2 secondary papillae adjacent to the excurrent aperture are more numerous on *M. dahurica* (Figure 1D) than in the pictures of *Margaritifera falcata* (Gould, 1850) and *Margaritifera hembeli* (Conrad, 1838) illustrated in Bogan et al. 2018.

Based on the specimens from two rivers and a lake, the degree of development of these secondary papillae on the external mantle of *M. dahurica* appears to depend on the velocity of current. Secondary papillae on the same species from sites in the Ingoda River with strong current present only Type 2 small knobs. Specimens from the Onon River with a very weak current exhibit longer, narrow secondary papillae, and specimens from Arey Lake with stagnant water possess secondary papillae that are well-developed and more elongate. Considering the figures presented here and those illustrated by Bogan et al. (2018), it is suggested that each species may have different numbers and distribution of these secondary papillae, but many more individuals of each species need to be assessed across the family.

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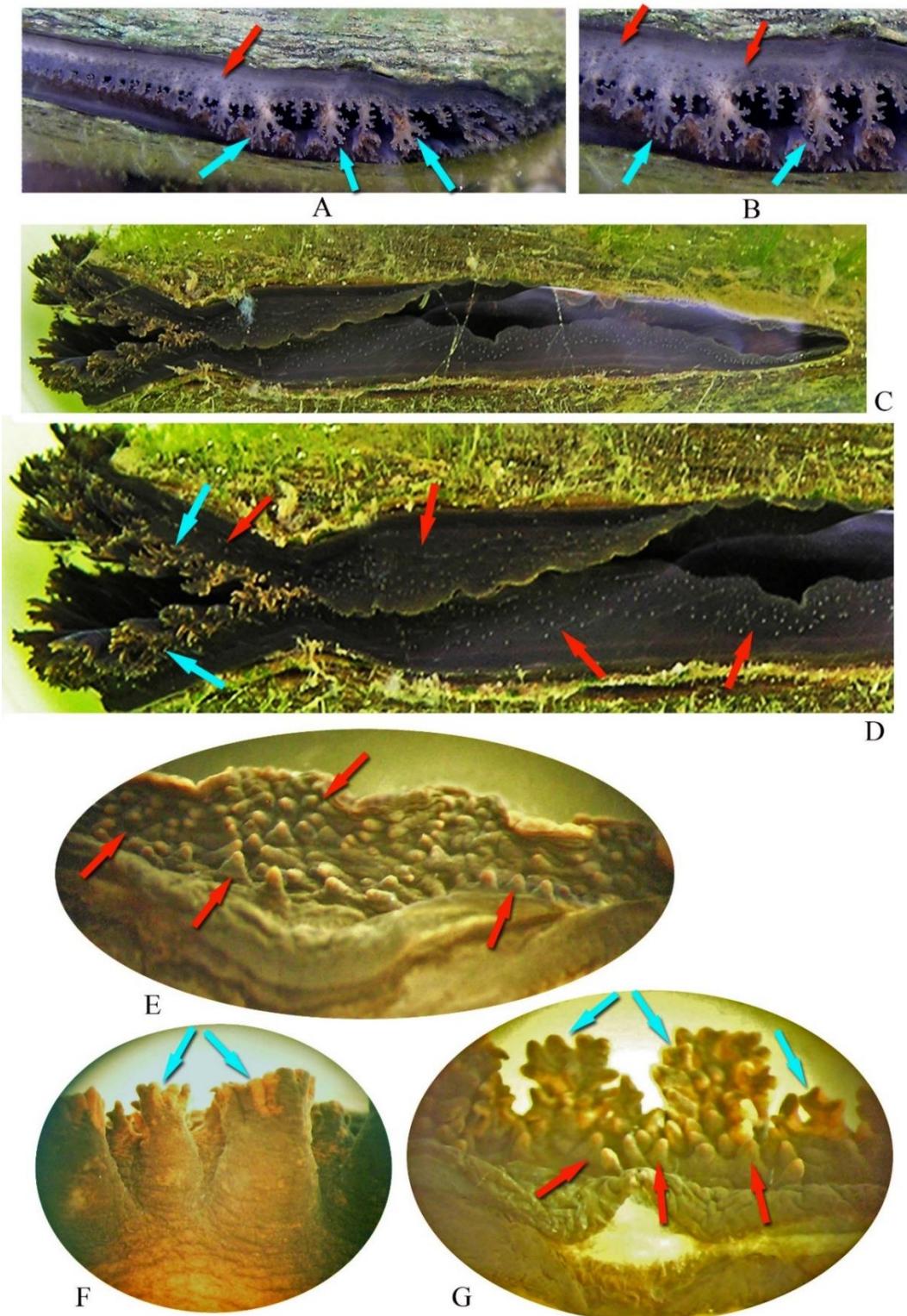


Figure 1. Papillae along the incurrent and excurrent apertures of *Margaritifera dahurica* from Ingoda River (A and B), Onon River (C and D), and from Arey Lake (E, F, and G), tributaries of the Amur River of eastern Russia. Red arrows - secondary papillae, blue arrows - arborescent [primary] papillae on the edge of incurrent aperture.

**Help Us Unravel the Mystery:
Genetic Differentiation of Chinese and Japanese Mysterysnails
with Future eDNA Collaboration**

Hannah Winkler, Shannon Walsh, Nicole Kelly, Shannon Odell, and Romi L. Burks
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Chinese and Japanese mysterysnails, *Cipangopaludina chinensis* and *C. japonica*, have similar shell size, color, spiraling, and ecological niches, making definitive species determination between the two difficult (Jokinen 1982). In North America, both of these snails represent non-native species that can quickly reach high densities in the wild, making their accurate identification imperative for invasive species management (Van Bocxlaer & Strong 2016). Although many populations in the Northeast and also the Great Lakes region cluster together, our undergraduate research lab found the first and only record of a Japanese mysterysnail in Texas (Perez et al. 2016). New students to the project (Winkler and Walsh, unpublished data) recently determined that its haplotype matches that of *C. japonica* Genbank samples from Pennsylvania and South Carolina (Figure 1).

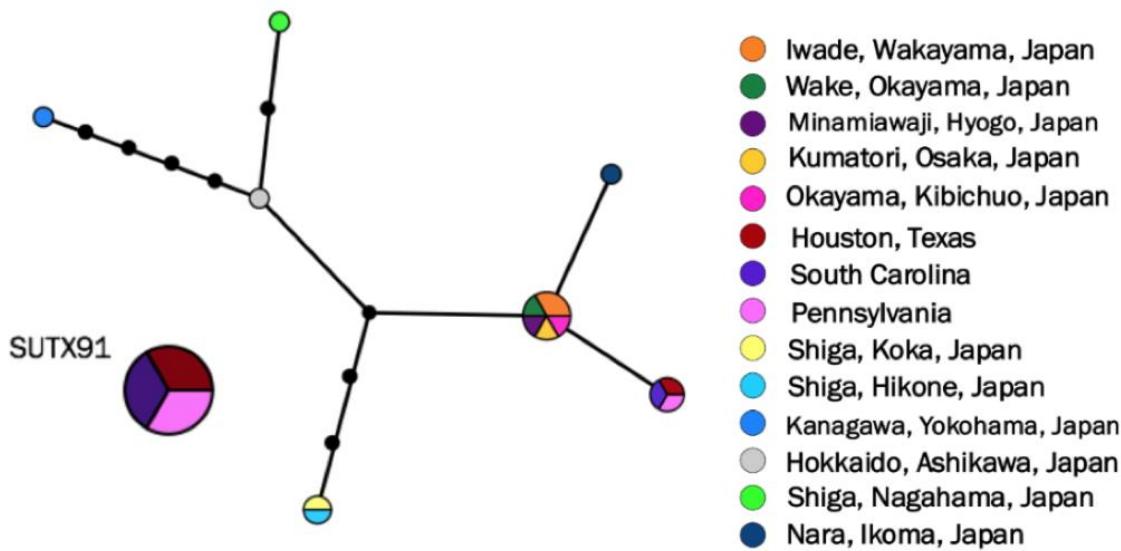


Figure 1. Haplotype map of available Genbank *C. japonica* sequences (15; alignment length: 446 base pairs), highlighting the haplotype match of our sample, SUTX91, to samples from South Carolina and Pennsylvania. The circles represent different haplotypes (7), colors represent different sites (14), steps represent base pair changes, and the larger the circle, the greater number of samples that match that haplotype.

Limited Genbank sequence data exists for both *C. chinensis* and *C. japonica* populations. Those sequences, when available, often fall short of the 658 base pairs possible for cytochrome oxidase c subunit I (COI) analysis. Consequently, current analysis may miss many genetic differences. Minimal data available for genetic comparison combined with the frequent transport of snails as part of the aquarium trade and aquaculture industry (Venezia et al. 2017) makes identical haplotypes a predictable finding (Van Bocxlaer & Strong 2016); however, the range of the invasions of these species opens the possibility for increased diversity. Haplotype analysis may also identify commonalities among unexpected populations, which could point toward ways to monitor for invasive species. Overall, more data would help unravel the mystery of whether genetics helps inform identifications of Asian mysterysnails.

The Call: We need both samples and possible collaborators (Figure 2). While our own mystery started in Texas, we lack the capability to collect a large quantity of Japanese and Chinese mysterysnails due to

low population numbers in our state. We have started to examine collections loaned by the Illinois Natural History Museum and our lab would like to acquire additional samples of both recently collected and preserved snails or museum specimens of both species. Undergraduate students will then determine their accurate identification using minimally-invasive tissue extraction and genetic sequencing. We would appreciate contact from any FCMS members with knowledge of any available *C. chinensis* or *C. japonica* samples that could meet our needs.

Besides examining the genetic diversity within and between these two invasive species of mysterysnails, our lab would also like to use mysterysnails to test specificity of primers designed to amplify environmental DNA (eDNA) and further our collaborative research on the “ecology of eDNA” with Dr. Matthew Barnes, Texas Tech University. Increased understanding of eDNA could make it a valuable tool for broad invasive species surveillance (Barnes and Turner 2015). Currently, we use a species of apple snail (*Pomacea maculata*) to investigate trends in the accumulation and degradation of eDNA under different environmental conditions. Future directions for eDNA may involve the development of species-specific *Cipangopaludina* eDNA primers to be used for non-native species detection. Such work would necessitate collaboration with researchers living in areas with high *C. chinensis* and *C. japonica* density (most likely, the Northeastern United States or Great Lakes region) so please reach out if this sounds like a good opportunity. We can provide instructions for sample preservation and shipping, and will recognize all contributors in acknowledgements of future presentations and publications. Through collaboration and/or sending samples, you could help us to not only accurately identify ecologically harmful non-native species, but also assist in the development of a new invasive species management technique. If interested, please contact the lead undergraduate researcher, Hannah Winkler (winklerh@southwestern.edu), or our faculty advisor, Dr. Romi Burks (burksr@southwestern.edu).

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**Help Us Find
The Missing
Piece!**



Figure 2. Our lab is requesting samples of Asian mysterysnails to be used for genetic analysis that will help us piece together our “mysterysnail puzzle.”

degradation of eDNA under different environmental conditions. Future directions for eDNA may involve the development of species-specific *Cipangopaludina* eDNA primers to be used for non-native species detection. Such work would necessitate collaboration with researchers living in areas with high *C. chinensis* and *C. japonica* density (most likely, the Northeastern United States or Great Lakes region) so please reach out if this sounds like a good opportunity. We can provide instructions for sample preservation and shipping, and will recognize all contributors in acknowledgements of future presentations and publications. Through collaboration and/or sending samples, you could help us to not only accurately identify ecologically harmful non-native species, but also assist in the development of a new invasive species management technique. If interested, please contact the lead undergraduate researcher, Hannah Winkler (winklerh@southwestern.edu), or our faculty advisor, Dr. Romi Burks (burksr@southwestern.edu).

2017 Tennessee's Mollusk Recovery Program Achievements

Don Hubbs, Mollusk Recovery Program Coordinator,
Tennessee Wildlife Resources Agency

The Tennessee Wildlife Resources Agency (TWRA) is the regulatory body primarily responsible for conservation and management of Tennessee's mollusks and other biological resources. Freshwater mollusks (mussels and snails) are proportionally the most imperiled group of animals 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 (damming) during the last century, resulting in the extinction or significant decline of over 70% of the mussel species and 74% of the snails. Within Tennessee, the U.S. Fish and Wildlife Service has listed 51 mussel species and two freshwater snail species as endangered or threatened under the Endangered Species Act, representing 50% of Tennessee's endangered fauna.

In 2017, TWRA continued its reintroduction and recovery efforts aimed at restoring freshwater mussel species diversity and distribution in Tennessee. Four established and one new site in three different rivers across Tennessee were stocked or augmented with additional specimens. Previously-stocked sites also were visually monitored for the persistence of released mussels during 2017 stocking efforts. Five endangered Cumberlandian mussel species were stocked into established restoration sites in the Duck, Elk, and Sequatchie rivers. One (Salamander Mussel, *Simpsonaias ambigua*, a greatest conservation need (GCN)) species in Tennessee, was stocked into two sites in the Duck River in Marshall County. One endangered extirpated species (Purple Catspaw, *Epioblasma obliquata*) was reintroduced at two sites in the Duck River in Marshall County.

In total 14,209 mussels of eight species including seven federally endangered were collected or propagated and stocked into five different sites in Tennessee waters during 2017 (Table 1). Since 2004, TWRA has stocked 75,169 mussels of 36 species, including 13 endangered species, into 15 sites in nine different rivers in Tennessee (Table 2).

TWRA's Mussel Recovery Program continues to rely heavily on partnerships with mollusk propagation facilities in the adjacent states of Alabama, Kentucky, and Virginia, often exchanging Tennessee adult brood stock for stockable-sized sub-adult mussels to release in Tennessee. Additional details of TWRA's mussel restoration activities are available in the annual report pdf available by email request to tnmussels@aol.com.

Table 1. Numbers of various mussel species stocked by TWRA during 2017 and the sites where they were introduced.

Species	Sites	Duck River Venable Springs	Duck River Lillard's Mill	Elk River Winding Stair Bluff	Elk River Veto Fish Trap	Sequatchie River Kettner's Mill	Totals
<i>Epioblasma brevidens</i> *	800				955		1755
<i>Epioblasma capsaeformis</i> *					500		500
<i>Epioblasma obliquata</i> *	50	50					100
<i>Lampsilis abrupta</i> *					133		133
<i>Lampsilis virescens</i> *			6500	1500	2458		10458
<i>Lemiox rimosus</i> *					120		120
<i>Simpsonaias ambigua</i>	50	150					200
<i>Toxolasma cylindrellus</i> *	190	190			563		943
Totals	1090	390	6500	3771	2458		14209

* Federal endangered or threatened species.

Table 2. Total mussels stocked by TWRA from 2004 through 2017, sorted by species and site.

Species	Sites		Duck River Shelbyville Dam	Duck River Venable Springs	Duck River Lillard's Mill	Duck River Hooper Island	Duck River Littlelot	Elk River Harms Mill	Elk River Winding Stair Bluff
	Big South Fork Cumberland River	Clinch River Kyles Ford							
<i>Actinonaias ligamentina</i>	6								
<i>Actinonaias pectorosa</i>									
<i>Aamblema plicata</i>	4								
<i>Cumberlandia monodonta</i> *	43				10				
<i>Cyclonaians tuberculata</i>									
<i>Cyprogenia stegaria</i> *					179				
<i>Dromus dromas</i> *	20								
<i>Ellipsaria lineolata</i>	50								
<i>Elliptio dilatata</i>	5								
<i>Epioblasma brevidens</i> *				800	3224				
<i>Epioblasma capsaeformis</i> *	98							103	
<i>Epioblasma obliquata</i> *				50	50				
<i>Epioblasma triquetra</i> *					519				
<i>Lampsilis abrupta</i> *	92	718			298		221	200	
<i>Lampsilis ovata</i>									
<i>Lampsilis fasciola</i>									
<i>Lampsilis virescens</i> *							1462	9500	
<i>Lasmigona costata</i>	2								
<i>Lemiox rimosus</i> *									
<i>Leptodea fragilis</i>	4								
<i>Ligumia recta</i>	23								
<i>Medionidus conradicus</i>									
<i>Obliquaria reflexa</i>	2								
<i>Pleurobema cordatum</i>	495								
<i>Pleurobema sintoxia</i>	15								
<i>Potamilus alatus</i>	7								
<i>Ptychobranchus fasciolaris</i>	34							141	
<i>Ptychobranchus subtentus</i> *	144		403		6480				
<i>Quadrula fragosa</i> *							103		
<i>Quadrula metanevra</i>	191								
<i>Quadrula pustulosa</i>	443								
<i>Quadrula quadrula</i>	2								
<i>Simpsonaias ambiguia</i>				50	150				
<i>Toxolasma cylindrellus</i> *				1290	190	600			
<i>Utterbackia imbecillis</i>	1								
<i>Villosa iris</i>									
Totals	1681	718	403	2190	11100	600	324	1662	9744

Table 2. (continued)

Species	Sites						
	Elk River Veto	Emory River Oakdale	Hiwassee River McCleary Island	Nolichucky River	Pigeon River below Wilton Springs	Sequatchie River Kettner's Mill	Totals
<i>Actinonaias ligamentina</i>				77	575		658
<i>Actinonaias pectorosa</i>				588	403		991
<i>Amblema plicata</i>							4
<i>Cumberlandia monodonta</i> *							53
<i>Cyclonaians tuberculata</i>					1396		1396
<i>Cyprogenia stegaria</i> *							179
<i>Dromus dromas</i> *							20
<i>Ellipsaria lineolata</i>							50
<i>Elliptio dilatata</i>				121	144		270
<i>Epioblasma brevidens</i> *	955			2696			7675
<i>Epioblasma capsaeformis</i> *	500	1620	2769	9204			14294
<i>Epioblasma obliquata</i> *							100
<i>Epioblasma triquetra</i> *							519
<i>Lampsilis abrupta</i> *	133			330			1992
<i>Lampsilis ovata</i>					217		217
<i>Lampsilis fasciola</i>					337		337
<i>Lampsilis virescens</i> *	1500					4258	16720
<i>Lasmigona costata</i>							2
<i>Lemiox rimosus</i> *	120			3014			3134
<i>Leptodea fragilis</i>							4
<i>Ligumia recta</i>							23
<i>Medionidus conradicus</i>		1100	800	4368	1101		7369
<i>Obliquaria reflexa</i>							2
<i>Pleurobema cordatum</i>							495
<i>Pleurobema sintoxia</i>							15
<i>Potamilus alatus</i>							7
<i>Ptychobranchus fasciolaris</i>				99	227		501
<i>Ptychobranchus subtentus</i> *				6283			13310
<i>Quadrula fragosa</i> *							103
<i>Quadrula metanevra</i>							191
<i>Quadrula pustulosa</i>					1027		1470
<i>Quadrula quadrula</i>							2
<i>Simpsonaias ambigua</i>							200
<i>Toxolasma cylindrellus</i> *	563						2643
<i>Utterbackia imbecillis</i>							1
<i>Villosa iris</i>					222		222
Totals	3771	2720	3569	26780	5649	4258	75169

* Federal endangered or threatened species.

**Additional Information Concerning the Conquest of Europe by the
Invasive Chinese Pond Mussel *Sinanodonta woodiana*, 46.
News from Belgium, Poland, Spain, and Sweden**

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Now and then, articles continue to appear dealing with various aspects of the invasive freshwater mussel *Sinanodonta woodiana* in Europe. The following information comes from Belgium, Poland, Spain and Sweden.

Belgium

Both in Belgium and the Netherlands ditches and canals are regularly cleaned from excessive plant growth, mud, etc. and this material is usually put on the banks of the watercourses. It often contains molluscs, both empty shells and living specimens. Frank de Winter reported last year about an event when he found several large live specimens of the Chinese pond mussel on the banks of a ditch in the Kalkense Meersen, in the Province East-Flanders of Belgium. The width and the height of the specimens amounted to almost 20 cm (Figure 1). This is the first record of this invasive species from East-Flanders.

Poland

Labecka and Domagala (2018) studied the reproductive activity of females of the Chinese pond mussel in cooling water in Poland. They found that gravid females are present the whole year round.

Spain

The Llobregat delta is one of the most important wetlands in Catalonia, Spain. A survey of its malacofauna revealed the presence of well-established populations of *Sinanodonta woodiana* at 11 localities (López-Soriano *et al.*, 2017).

Sweden

During the years 2005-2013, Chinese pond mussels have been found at four localities in southern Sweden. Information concerning this species in that northern European country has been summarized on a single page in a guide dealing with the Swedish freshwater mussels (von Proschwitz *et al.*, 2017).

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Figure 1. A Chinese pond mussel *Sinanodonta woodiana* from Kalkense Meersen, East-Flanders, Belgium. Photograph by F. de Winter

Find of *Scabies crispata* in the Netherlands and the International Aquarium Trade as a Most Likely Source

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On 13 November 2017, an interesting unidentified freshwater mussel suddenly appeared on the Dutch website dealing with faunistic and floristic observations in the Netherlands (waarne ming.nl). This mussel had been found by Arie Twigt in a heap of so-called ditch cleanings on the bank of the Zanderij in Katwijk, the Netherlands. The specimen was immediately recognized by several readers of these observations as being *Scabies crispata* (Figure 1), an exotic mussel species confined in its distribution to southeast Asia (Brandt, 1974; Do, Tuan and Bogan, 2018).

Although the mussel was collected as an empty shell, the valves were still connected to each other. How did a southeast Asian mussel arrive in a ditch near Katwijk? The most likely explanation is by means of an aquarium-keeper who got rid of unwanted stuff. The same activity also occurs regularly in Israel; excess material from an aquarium or garden pond is simply dumped in a nearby watercourse.

A check of the internet revealed that *Scabies crispata* is not only being sold in numerous aquarium shops in the Netherlands (Figure 2) but also is offered for sale on

marktplaats [=marketplace] by private persons. Some firms even mention that their specimens originally come from Thailand.

I doubt very much that *Scabies crispata* is able to survive the cold winters in most of the open water in the Netherlands. All over the country, however, are spots where the water is being heated by water used for cooling turbines or other machinery. At such places, all kind of (sub-)tropical aquatic animals turn up which, probably, were



Figure 2. Illustration for the sale of *Scabies crispata* in a shop in the Netherlands.

released from aquariums, not only snails but especially aquarium fish.

Scabies crispata is not the only exotic mussel species which is available in the Netherlands. I came across one firm that offers local *Anodonta cygnea*; however, the picture was that of a juvenile *Sinanodonta woodiana* (Figure 3)!

During my annual visits to my native the Netherlands, I have also seen North-American mussel species for sale. It becomes high time to regulate the sale of all kind of exotic freshwater molluscs in aquarium shops and garden centers, not only in the Netherlands but also elsewhere.



Figure 1. *Scabies crispata* found in the Zanderij near Katwijk, the Netherlands. Photograph by Arie Twigt.



Figure 3. Illustration for the sale of the local *Anodonta cygnea* by a firm in the Netherlands. The shown mussel is, however, a juvenile *Sinanodonta woodiana*!

References:

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Website:

<https://waarneming.nl/waarneming/view/145847690>

The Freshwater Mollusks “Officially Endangered” in the State of Santa Catarina/ SC, Central Southern Brazil: A Brief Critical Review of their Current Situation

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The most recent edition of the Official Lists of Brazilian Mollusk Species considered as Threatened with Extinction was published in 2016 (ICMBio 2016). With regard to mollusks, there was no change from the numbers included in the previous edition: an overall total of only 23 species occurring in the vast Union territory, six of which are marine (1 bivalve, 5 gastropods), nine limnic/freshwater (of our immediate interest – 2 bivalves, 7 gastropods) and eighth terrestrial gastropods. The numbers of mollusks were not changed in spite of our critical evaluation of the previous list (Agudo-Padrón 2015a). For a chronology of the evaluation process carried out, see Santos and Miyahira (2018).

Recently, species that have been considered "extinct" in nature, for example, have been found in the environment (Salvador et al., 2018). In general terms, the mollusk species listed in the Official List of Threatened Species of Extinction today clearly represents the lack of knowledge that still prevails over the group and the significant lack of publications on species surveys in Brazil in general. A step forward toward that purpose has recently been consolidated for the geographical territory of the State of Santa Catarina/ SC through the register of 1.021 verified continental and marine forms (Agudo-Padrón 2015c, 2017b, 2018) – 1.018 already published, and three other continental (two terrestrial and one limnic/freshwater bivalve) still unpublished.

In addition to two marine species (1 bivalve and 1 gastropod) and one terrestrial gastropod, of the species mentioned in the Official List of Endangered Species, only the following five limnic/ freshwater (2 bivalves, 3 gastropods) occur in the geographic territory of the State:

BIVALVIA/ UNIONOIDA/ HYRIIDAE

Diplodon (Rhipidodonta) koseritzii (Clessin, 1888)

- Its inclusion in the list was questioned in 2015 (Agudo-Padrón 2015a:174)

BIVALVIA/ UNIONOIDA/ MYCETOPODIDAE

Mycetopoda legumen (Martens, 1888)

- Its inclusion in the list was questioned in 2015 (Agudo-Padrón 2015a:174)

GASTROPODA/ CAENOGASTROPODA/ AMPULLARIIDAE

Pomacea sordida (Swainson, 1823)

- Its inclusion in the list was questioned in 2015 (Agudo-Padrón 2015a:174, 2016)

GASTROPODA/ PULMONATA/ PHYSIDAE

Physa marmorata Guilding, 1828

- Its inclusion in the list was questioned in 2015 (Agudo-Padrón 2015a:174, 2015b)

GASTROPODA/ PULMONATA/ LYMNAEIDAE
Lymnaea rupestris Paraense, 1982 (Figure 1)

This is the only freshwater species of the State mentioned in the Official List that justifiably deserves to be included due to its "endemism" in a restricted and fragile habitat (Paraense 1982 (sic): "... An important ecological characteristic of *L. rupestris* is its habitat on wet rocks most often outside bodies of water, although in close proximity to them."). It is one of the 24 endemic (3 limnic/freshwater and 21 terrestrial) gastropod forms that occur in the geographic territory of the State (Agudo-Padrón 2012:40 - Table 1).

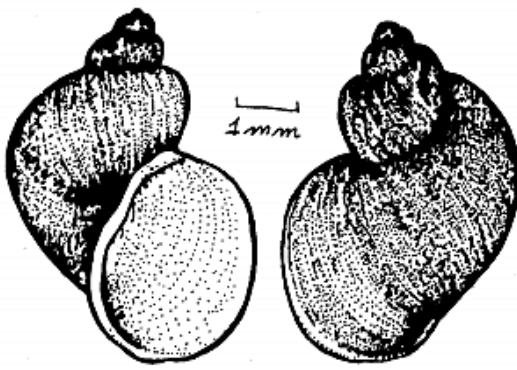


Figure 1. The rare endemic freshwater snail *Lymnaea rupestris* Paraense, 1982 (left) and its type-locality Nova Teutônia, a village in the Municipality of Seara ($27^{\circ}07'S$; $52^{\circ}17'W$ - Map, red color) in the Ariranha River Microbasin in the Western Malacological State Region 3 (Upper Uruguay River Basin), Santa Catarina/ SC, Central Southern Brazil. This species occurs on on wet rocks along steep brooks and streams, a restricted environment severely threatened by anthropogenic activities (see Agudo-Padrón 2017a).

The recent information presented by Santos and Miyahira (2018) indicates that Brazilian Malacologists realize the problems with the latest Official List and have started working to correct them. Given with this positive work scenario, we hope that the claims presented in various recent publications (such as Agudo-Padrón 2015a, 2015b, 2016) can finally be considered and included.

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First Occurrence of the Native Freshwater Clam Cyrenidae *Cyanocyclas paranacensis* (d'Orbigny, 1835) in Santa Catarina State, Central Southern Brazil

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On April 17, 2018, Ana Marta Schafaschek, a local professional field biologist, sent us some photographs of singular little limnic bivalves/clams (the larger specimen collected is approximately 10mm, Figure 1). The specimens were found in a riverside sector of the Rio da Lança (Lance River) basin in the Mafra Municipal District (26°06'39"S & 49°48'18"), at approximately 793 meters above sea level (Figure 2). This river is part of the Iguaçu River basin and is located in the North Malacological Region 2 of Santa Catarina State/ SC, Central Southern Brazil (Agudo-Padrón 2018b:58) (Figure 2). Few malacological studies have been carried out so far in this part of the State (Agudo-Padrón & Luz 2016).

The species involved finally was confirmed by us to be the native freshwater clam Veneroidae Cyrenidae (previously Corbiculidae) *Cyanocyclas (Neocorbicula) paranacensis* (d'Orbigny, 1835), a species endemic to the Southern Cone region in South America (Pereira et al. 2012:93, Table III; Pereira et al. 2013:26-Table 2). This is the first confirmed record of this native freshwater clam in Santa Catarina State/ SC, bringing to 35 the list of regional known limnic bivalves and the fifth representative of the family recognized so far in the State (Agudo-Padrón 2018a:40 Table 1). It brings to 233 the total of continental mollusks known from the State (Agudo-Padrón 2018b) and is one of the three species that were pending by formal report (Agudo-Padrón 2018c).



Figure 1. Specimens of native freshwater clam *Cyanocyclas paranacensis* (d'Orbigny, 1835) found in the Rio da Lança (Lance River) hydrographic basin. Photographs by Anã Marta Schafaschek

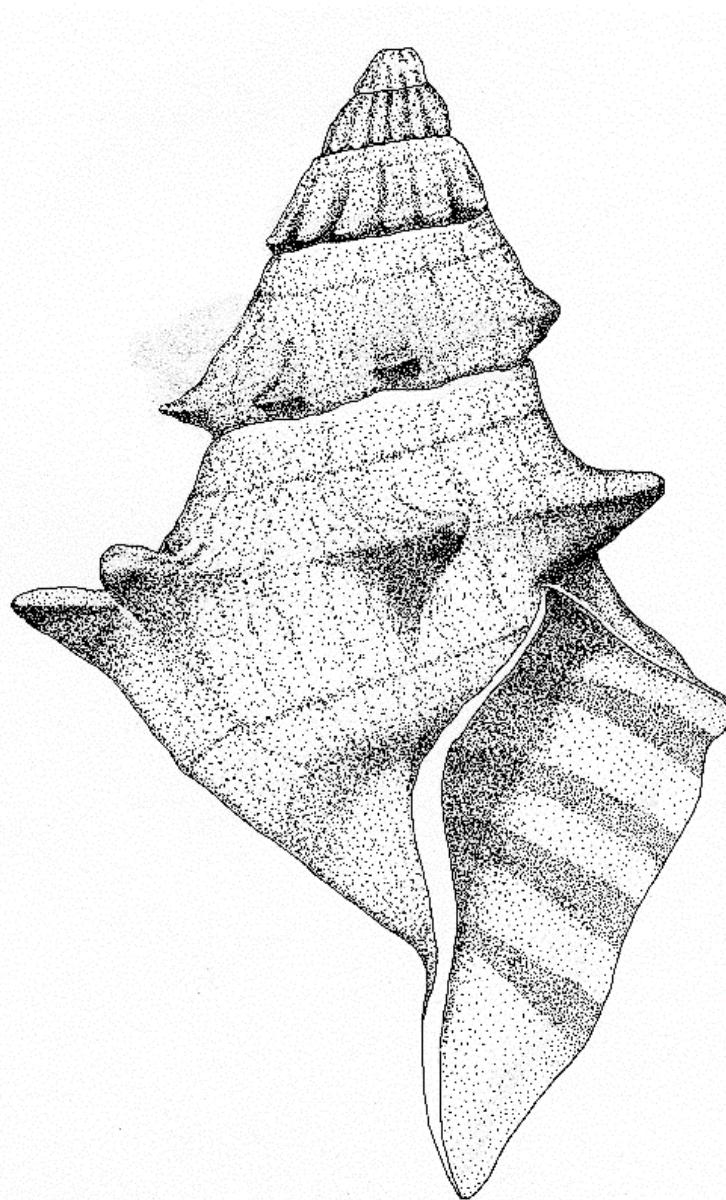


Figure 2. Location (map – red color) of the Mafra Municipal District in the North region of Santa Catarina State/ SC and a view of the Rio da Lança.

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2017 Freshwater Bivalve Bibliography

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The following are references to around 200 papers on freshwater bivalves published up to and including 2017 that have not appeared in previous FMCS bibliographies. [Previously unlisted papers on freshwater gastropods are NOT included; they may be added at a later time.] The citations are split into four groups for the convenience of researchers: Unionoida, Sphaeriidae, Corbiculidae, Dreissenidae and other FW bivalves. Those papers that include taxa from more than one of the above categories are included under each group.

A web searchable database of over 26,000 references on freshwater mollusks (including all previous FMCS bibliographies on freshwater mollusks) can be found at a **NEW ADDRESS:** <http://fms.inhs.illinois.edu/fmi/webd#Mollusk%20Bibliography>. Only one user can access the bibliography at a time (we hope to remedy this in the near future) so be sure to exit when finished. To ensure that papers are cited correctly, researchers are encouraged to send pdf's to: Kevin S. Cummings, email: kscummin@illinois.edu

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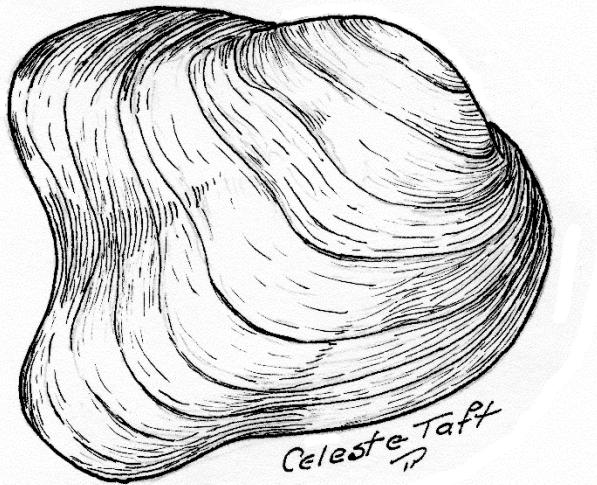
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Epioblasma flexuosa (Rafinesque, 1820).

Length = 69mm

Obituary

David Honor Stansbery 1926 – 2017

David Honor Stansbery, age 91, passed away on August 24, 2017, in Columbus, Ohio. David was the son of Honor Gerald Stansbery and Daisy Elizabeth Kirby of Upper Sandusky, Ohio. He was a graduate and Senior Class President of Upper Sandusky (Ohio) High School and served in the U.S. Navy from 1944 to 1946. He received his B.S. (1950), M.S. (1953), and Ph.D. (1960) degrees, all from The Ohio State University (OSU). From 1962 to 1972, Dr. Stansbery was Curator of Natural History at the Ohio Historical Society. He was Curator of Mollusks at the OSU Museum of Biological Diversity from 1970 to 2000, and, for years, taught Animal Ecology as a Professor of Zoology in what was then the OSU Department of Botany and Zoology. Dr. Stansbery served on many OSU committees, ranging from the Graduate Committee to the OSU Campaign. He was an OSU Professor Emeritus from 2000 until his death. He also was a Visiting Scientist at the National Museum of Natural History in Washington, D.C. and at the Huazhong Agricultural University in Wuhan, China.



Together with his staff and students (>20 M.S. or Ph.D.), Dr. Stansbery collected and assembled what is arguably the largest collection of freshwater mollusks in the world: more than 1.6 million specimens. He, along with a wide variety of coauthors, published well over 200 papers on freshwater mollusks and their conservation. He also served as editor or on the editorial board of seven journals.

Dr. Stansbery was widely regarded as a world-expert on freshwater mollusks and as a champion of their conservation long before it was fashionable to do so. At various times, he served on the National Board of Trustees and Governors of The Nature Conservancy, as President of the American Malacological Union, on the Board of Directors of the American Rivers Conservation Council, as a Trustee of the Columbus Audubon Society. He also served as a consultant to numerous organizations including the Environmental Defense Fund. Over the years, he received the Ohio Conservation Achievement Award, The Nature Conservancy Oak Leaf Award, and the first Lifetime Achievement Award presented by the Freshwater Mollusk Conservation Society. Dr. Stansbery held fellowships in several organizations, including the American Association for the Advancement of Science and the Ohio Academy of Science, and was a Senior Conservation Fellow in Hydrobiology at the Franz Theodore Stone Institute of Hydrobiology.

Over and beyond his various academic accomplishments, Dave Stansbery was a welcoming, patient, and knowledgeable source of information about freshwater mussels and their habitats for anyone who contacted him. As this obituary was being prepared, several recipients of his help were invited to share their memories of his contributions to their work or careers. Here (in more-or-less chronological order) are their stories:

John Jenkinson -- I met Dr. Stansbery in 1962, soon after he was hired by the Ohio Historical Society to replace the retiring Edward S. Thomas, an entomologist I had met as a high school student interested in butterflies. By 1963, I was working for Dr. Stansbery as an Ohio State Work Study student, sitting at a sink scrubbing shells while he and Carol Stein were nearby sorting and identifying the freshwater mussels that I and others had cleaned. In 1964 and 1965, I had the pleasure of joining Dr. Stansbery on a number of collecting trips, including what may have been his first trip west of the Mississippi River (in Missouri), on his last visit to the Stones River in Tennessee before it was impounded, and on his resurvey of Arnold Ortmann's sampling sites on the upper Clinch River in Virginia and Tennessee. All of these experiences, augmented by the wide-ranging lunchtime conversations that Dr. Stansbery hosted involving everyone in the office, jumpstarted my life-long interest in the diversity of freshwater mussels, their distribution patterns, and the geologic history that still seems to have been responsible for both.

Marc Imlay -- I first met David Stansbery after I heard him give a lecture in the Midwest in 1969. I also met him at an Earth Day event in 1970. His confirmation of the endangered status of several freshwater mussel species I surveyed for in Minnesota and Wisconsin, convinced me to transfer from my Federal job in Minnesota to working for the Office of Endangered Species in Washington, D.C. in 1972. David Stansbery and Carol Stein assisted me in conducting Status Reviews for about 50 mussel species in 1973 to validate listing them as endangered species. At that time, there was resistance to listing mussels, especially concern about water project conflicts. Using the information in those Status Reviews, as well as Status Review verifications by other malacologists, I succeeded in placing 23 mussel species on the International Union for Conservation of Nature List of internationally endangered species in 1975. That listing bridged the threshold of political resistance in the United States. I proposed them for the U.S. List of Endangered Species in 1976 and they were listed later that same year. Dr. Stansbery's contributions were necessary for the listing of endangered molluscs as early as they occurred. The first mussel listings would not have happened when they did without his involvement.

Jim Williams -- In the fall of 1971, Jack Burch suggested I ask Dave Stansbery to participate as an expert witness in the lawsuit against the U.S. Army Corps of Engineers over the construction of the Tennessee-Tombigbee Waterway in west Alabama and northeast Mississippi. Dave responded by asking me if I could send him some shells from the Tombigbee River so he could see what was left of the mussel fauna. With no knowledge of mussels and no idea of what I was picking up, the first 8-10 boxes of shell I shipped contained very little beyond common widespread species, nevertheless Dave was excited about the possibility of a more diverse mussel fauna. Eventually, in late 1971, came the boxes that contained shells of *Epioblasma penita*, *Obovaria unicolor*, *Pleurobema curtum*, *Pleurobema marshalli*, *Pleurobema taitianum*, and *Quadrula stapes* (now *Theliderma stapes*). He was shocked that these six species were still alive and well in the Tombigbee because he had assumed they were probably extinct since they had not been collected in several decades. After Dave identified these six species, he asked if he could come down for a visit and go out on the river. During Dave's visits in May and June 1972, we returned to the localities where I had picked up dozens of shells of the six species plus a couple dozen other taxa. Those collections convinced him that he should participate in the trial as an expert witness and present evidence on the mussel diversity of the Tombigbee River. The few days that I spent in the field with Dave that spring, plus the following "tons" of shell from the Tombigbee that I shipped to Ohio State University Museum, set me on a path to study freshwater mussels. Without Dave's patience and generosity in answering many questions during the next decade, I could never have launched my foray into the mussel world. I consider Dave Stansbery, along with Jack Burch and Samuel Fuller, to be my three mussel mentors.

Bill Kasson -- I enrolled at The Ohio State University for my second college career in 1973. I was eligible for the Work-Study Program and I said "sure" when the Program suggested the Museum of Zoology. So, I went to the Museum and met Dr. Stansbery. As with all new students, he had me cleaning naiads or as he called them "Freshwater Unionid Bivalve Mollusks."

It seems that working with Dr. Stansbery was always an adventure. Over the years, on many collecting trips to Kentucky, West Virginia, Virginia, and other states, Dr. Stansbery taught me and others Natural History. I assisted on mussel surveys on many rivers, including the Ohio and Scioto, and spent two weeks with him on the St. Francis River in Arkansas. I also surveyed the naiads of the entire Muskingum River from the headwater to the mouth at the Ohio River; that was a 3-year adventure. One month was spent at the Lake Erie Island doing a 50-year anniversary of the Gastropods of the area with Dr. Carol Stein. All adventures.

From the informative lunches to having him blindly guess four *Pluerobema* species held behind his back (He identified them all correctly. We even threw in an anomaly which he caught right away.), being with him was always a delight. He once apologized to me for something. I don't remember what it was, but I thought why is this man apologizing to me, a youngling. He taught me a life lesson which I continue to practice. Because of him, I graduated, and, to this day, he continues to influence my life.

Art Bogan -- I first met Dave Stansbery during the summer of 1976 at the American Malacological Union [now Society] meeting hosted in Columbus. While attending the meeting, Paul Parmalee and I visited the OSU mollusk collections for the first time. Dave was very enthusiastic and supportive of Paul's and my interests in the freshwater mussels of Tennessee, both modern and archaeological. Over the years, he was extremely encouraging, helpful, provided specimens for our use, and assisted with identifications. He continuously encouraged us to look beyond the shell and to examine the anatomy of closely related species. Dave was always pleasant and helpful and full of ideas and suggestions. He is missed.

Alan Buchanan -- In 1977, I was hired by the state of Missouri as a malacologist with an initial task of determining what important mussel species might be affected by construction of five dams in the Meramec River Basin. Fortunately for me, knowing almost nothing about mussels and absolutely nothing about mussel taxonomy, my boss arranged for me to spend a week at Ohio State University with Dr. David Stansbery, whom he had known since both were students there. What an incredible opportunity. Dr. Stansbery tutored me in mussel taxonomy, biology, life history, etc. and helped me learn how to differentiate between species. Dr. Stansbery had a lot of the traditional naturalist in him, so during lunches in the Museum break room and at other times, he would lecture/inform those in attendance on a wide variety of subjects. When not working

with the collection or mentees, he was writing letters to oppose changes to streams or giving testimony at hearings on proposed changes which could have huge negative impacts on native molluscs.

After my first stint at OSU, the Missouri Department of Conservation hired David to spend a week with me in the Meramec River Basin for hands-on training. It was incredibly helpful. He would often just plop down in the water and start pulling up mussels, all the time providing insight on stream conditions favorable to mussels. At the end of that trip he provided me with a collection of all the mussel species known from or likely to occur in Missouri.

Over the following years, there were continued visits to OSU, frequent phone calls, and encounters at conferences and symposia, during which I and others continued to absorb his knowledge and watch our numbers and abilities grow. David Stansbery empowered me to become a malacologist, and I was just one of many that he mentored. Today there are an incredible number of professional malacologists in this country, many of whom benefited from the teachings of David Stansbery and others like him. One of his messages was to always persevere, and so we have.

Keith Perkins – For students like me, who were interested in freshwater biology, especially freshwater invertebrate animals, the 1970s and 80s were wonderful times to take classes at Ohio State University and OSU’s Stone Laboratory on Lake Erie. Our days were spent with professors like John L. Crites, N. Wilson Britt, Peter W. Pappas, Barry D. Valentine, Ronald L. Stuckey, and Dr. David H. Stansbery. Dr. Stansbery was my advisor. As much or more than anyone I have ever known, he displayed in all facets of his life the “Honor” that was his middle name.

Paul Hartfield – The Great Pearl River Easter Flood of 1979 flooded the Mississippi Museum of Natural Science, floating some old cabinets containing old mussel specimens and distributing them widely through the museum. Luckily, most of the shells were cataloged with locations, but few of them had identifications. Having inherited this situation, and as an aquatic entomologist inadequate for the task of identification, I was unable to find anyone in the State who could help me. I was eventually directed to Dr. Stansbery, who invited me to Ohio State, gave me a week-long crash course in mussel identification and curation, and sent me back to Mississippi with the mission to collect and identify the poorly documented molluscan fauna of the State. From then on, Dr. Stansbery was always available for a call or visit, and extremely patient with our on-the-job identification process, propelling my career into completely unexpected directions! And I was not alone. During the 80’s, everyone I knew with mussel expertise relied on Dr. Stansbery to one degree or another. I’m no longer directly in the mussel identification business, but I can now rely on a phalanx of trained malacologists across the Southeast for the latest in mollusk taxonomy, genetics, and even behavior, all due in large part to the influence of Dr. Dave Stansbery! What a remarkable legacy!

Mike Hoggarth -- I was a beginning master’s student at the University of North Alabama in 1978 and my research advisor, Dr. Paul Yokley, often talked about his PhD advisor David Stansbery. I knew next to nothing about freshwater mussels at the time, but quickly learned to admire the fascinating diversity and life history of mussels as I also came to admire the one person everyone looked to for information about these animals, Dr. David H. Stansbery. As I was finishing my work at North Alabama, Dr. Yokley encouraged me to apply to study with Dr. Stansbery, and I met him for the first time in the summer of 1980 as I entered the graduate school at The Ohio State University.

Over the years, Dr. Stansbery was central to many memorable moments for me, but three stand out the most. At our first meeting, we spent hours systematically moving through the mussel collection, a collection that would form the basis of my dissertation, as it has for many others. I later discovered that experience was not unique; Dr. Stansbery freely gave of his time and intellect to anyone who could benefit from it. Second, the week we spent collecting on the Calcasieu River in Louisiana was memorable mostly because of the large snakes (all of which I knew were venomous) that would roll off the branches ahead of us up to our necks in the river while noodling for mussels. I was sure they would bite us on the way downstream but, since I was taller than Dave, I knew he would encounter the lion’s share of the snakes. He assured me they were more afraid of us than I was of them, and he was right. We collected lots of mussels and no snake bites. And finally, when I discovered a population of what everyone thought was an extinct species, (the purple cat’s paw pearl mussel, *Epioblasma obliquata*) in Killbuck Creek in Ohio, the first person I had to tell was Dr. Stansbery. He was as excited by the find as if he had found it himself and, in a way, he had. So much of what I do and know about mussels today is because of what I learned listening to and working with Dr. Dave Stansbery.

Tom Watters -- The first time I saw Dr. David Stansbery, on a day in 1980, he looked the same as he did every other time I saw him – a man in a white lab coat bent over a tray of specimens. I don’t think he knew what to make of me. I was trained in marine malacology, but I couldn’t identify a freshwater mussel if my life depended on it. He and his alter ego Carol Stein regarded me with some skepticism until one day they came into my office with a marine shell. It was Lister’s Conch, *Mirabilisstrombus listeri*, and they had read that it was exceedingly rare. I could see the excitement in their eyes; did the Museum actually own a specimen? Alas, I had to tell them that collectors had found the snail’s provenance and that the shells were becoming increasingly common on the market. Their hopes were dashed but I had won their respect. Soon after, I was granted the Keys to the Kingdom, the keys to the collection range where I would spend countless hours and ask

countless questions, which Dave was always patiently willing to answer. I was even invited on collection trips, the most memorable being to the Clinch River, where the engine pretty much fell out of the car, goats woke us up as they grazed the grass at the hotel, and I learned that civilized collectors always stopped for lunch regardless of where they were. Lunch was important, and perhaps my fondest memories were lunches at the Museum. Dave held court at the end of the table where he methodically made the same lunch every day. But it was his vast knowledge on any given subject, his easy laugh, and his amazing stories that charmed all around him. Dave was a true Renaissance man and the world is a lesser place for his passing.

Heidi Dunn – I credit Dr. Stansbery with being the spark that started many peoples' interest in freshwater mussels, including mine. I can't remember exactly when I first met David Stansbery, but it was some time in the early 1980's as I started working with freshwater mussels. I went to his museum several times to review specimens and get his opinion on identifications. I also recall him coming to St. Louis one year for a shell club meeting and taking the time to have lunch with me and answer questions. He was always available and eager to assist. In 1990, I had the privilege of taking his Malacology class at Tech Aqua, the field station of Tennessee Technological University. That was one of the best classes I have ever attended; two weeks of non-stop mussels! He also helped me start my business by referring some clients my direction and sending his best Ph.D. candidate, Tom Watters, to work with me for a few years. His contributions to my knowledge of freshwater mussels and career will not be forgotten.

Wendell Haag – In the 1980s, I was an undergraduate student becoming obsessed with mussels. At that time, Dr. Stansbery was the undisputed dean of freshwater malacology—almost a god. I was beside myself with excitement when my undergraduate mentors, Guenter Schuster and Ron Cicerello, took me on my first visit to the Ohio State University Museum of Zoology. I was overwhelmed by the collection and rapt as Dr. Stansbery discoursed on mussels in his courtly, gracious manner. Over the next few years, I sent many collections to OSUMZ and Dr. Stansbery periodically sent the accession sheet and an encouraging letter in his distinctive cursive when he came across a collection of particular interest. Knowing that the great Dr. Stansbery was interested in my efforts was heady stuff. Upon graduation, I was thrilled to begin a master's program under Dr. Stansbery and was assigned an office down the hall from his. I probably annoyed him with questions, but he was always patient and generous, and those days in the museum were formative experiences. As I began my career, I sent him my reprints and he responded in his characteristically encouraging and gracious way.

Dr. Stansbery's name is not heard today as often as it should be because he was of a time when publications and citations were not the primary measure of one's impact or legacy. His greatest tangible contribution is the research collection he built—one of the most important in existence, especially from a conservation perspective. Seeing firsthand the magnificent collections he made in the 1960s hammered home to me the staggering extent to which the natural world has been degraded in only a few decades. Because of his meticulous curation, this collection remains available to future generations. Equally important, Dr. Stansbery was an early and vocal champion of mussel conservation, and he was an inspiration and mentor to this movement as it gained momentum near the end of his career. I believe he has profoundly influenced all of us who follow in his footsteps, whether we know it or not.

His family says that Dr. Stansbery never really retired. After helping the Museum move to the OSU West Campus,, he built a small research museum onto his home and spent more and more time working there with the help of Kathy Borror. As he aged, he became less able to focus on necessary things and, as is often the case, his family and close friends were the last to notice. They enabled him and made excuses for his lapses of memory. While he became less likely to reach out to others, he was always absolutely delighted when anyone came to visit and usually could remember the history of his relationship with that person down to the small details. Going through his papers and correspondence, one realizes just how many people, groups, causes, agencies, and institutions he worked with, and how many things were left undone in his final years. Yet, even in his last year of life, he had not lost his passion for talking with anyone about anything, especially about freshwater mussels.

The Stansbery family has donated his malacological library and personal collection of specimens to the OSU Museum Division of Molluscs. In January 2018, volunteers from the Mollusc Division moved more than 250 boxes of books (ca. 1,100 items) and 250 boxes of shells to the Museum. The library has been catalogued and will be appraised. One of the most complete private malacological libraries in the world, it contains many very rare works, including originals of Bourguignat, Caxton, Conrad, Germain, Heude, Kuester, Lamarck, Locard, de Montfort, Rumphius, Say, and many others. Within the next few months, the mollusc collection will be officially dedicated in Dr. Stansbery's honor and commemorated with a plaque and a small ceremony for family, students, and friends.

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Ellipsaria is posted on the FMCS web site quarterly: around the first of March, June, September, and December. This newsletter routinely includes Society news, abstracts, meeting notices, pertinent announcements, informal articles about ongoing research, and comments on current issues affecting freshwater mollusks. Anyone may submit material for inclusion in *Ellipsaria* and all issues are accessible to anyone on the FMCS website (<http://molluskconservation.org>).

Information for possible inclusion in *Ellipsaria* should be submitted via e-mail to the editor, John Jenkinson, at ijjenkinson@hotmail.com. Contributions may be submitted at any time but are due by the 15th of the month before each issue is posted. MSWord is optimal for text documents but the editor may be able to convert other formats. Graphics should be in a form that can be manipulated using PhotoShop. Please limit the length of informal articles to about one page of text. Note that submissions are not peer reviewed but are checked for clarity and appropriateness for this freshwater mollusk newsletter. Feel free to contact the editor with questions about possible submissions or transmission concerns.

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If you are interested in participating in committee activities, please contact one of the appropriate chairs.

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Information Exchange (continued)

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Mussel Status and Distribution

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Propagation, Restoration, & Introduction

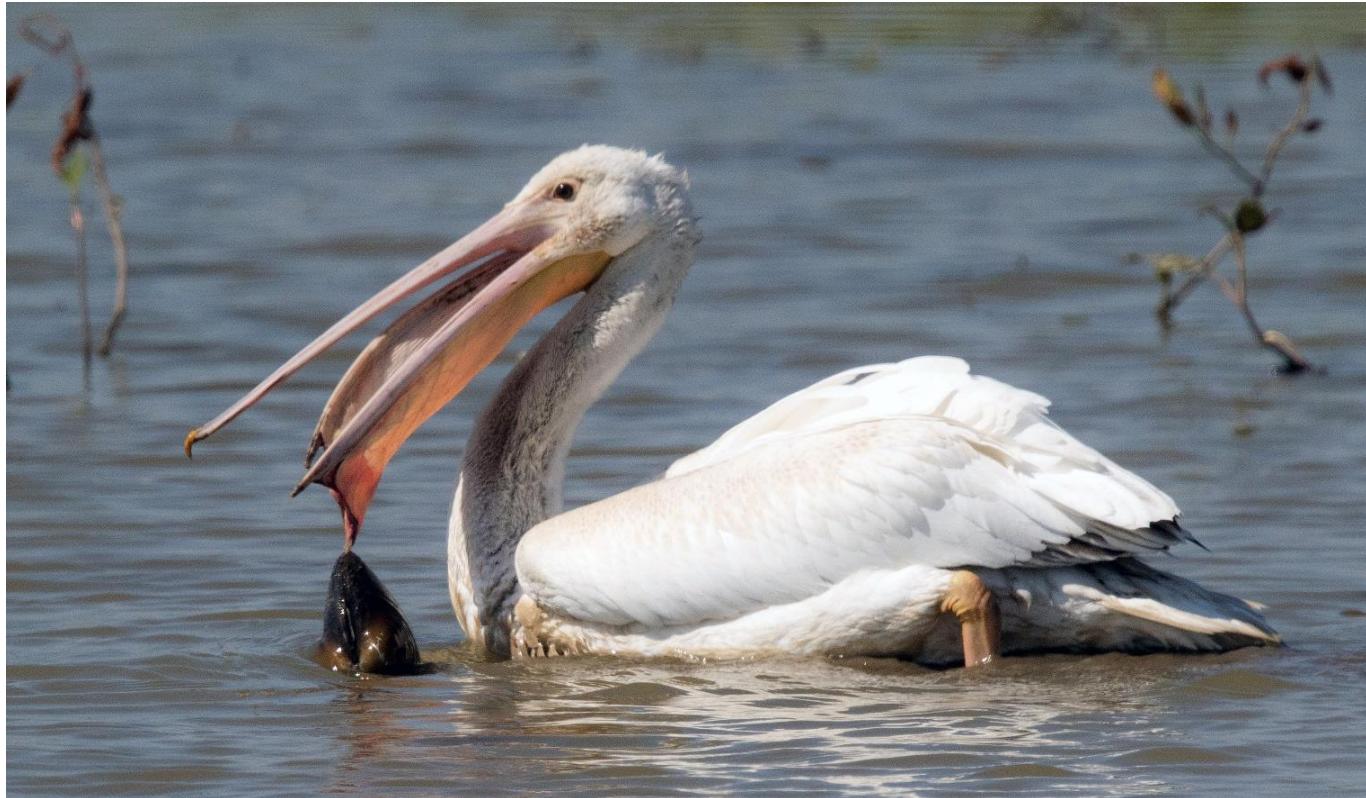
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Symposium

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Parting Shot



This American White Pelican got more than it bargained for when it went diving for dinner in one of the wetlands at the Goose Pond Fish and Wildlife Area in Greene County, Indiana. One of the many Giant Floater (*Pyganodon grandis*) that live in those ponds somehow clamped down on its pouch. All of the shaking and dunking the bird must have done to try to get rid of the mussel only seems to have caused more damage to its pouch and beak. This picture was taken by Ryan Sanderson, an Indiana birder, and was researched and submitted by Brant Fisher, Nongame Aquatic Biologist, Indiana Department of Natural Resources.

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.

