Newsletter of the Freshwater Mollusk Conservation Society
Volume 19 – Number 3 September 2017

2018 FMCS Workshop

Throughout parts of the United States and Europe, conservation efforts by state, federal, and private entities on behalf of freshwater mussels and snails now often include hatchery propagation, stocking from hatcheries to natural waters, and translocations within and between river basins. Everyone involved in these activities needs to understand the potential risks of introducing pathogens and spreading diseases. In addition, the causes of many mussel and snail die-offs over the years have not been identified. Now, however,

the availability of new diagnostic tools and techniques could provide improved procedures for responding when future die-off events occur.

Next March, FMCS will hold a 3-day Mollusk Health and Disease Workshop that will provide a basic understanding of aquatic disease organisms and tools for assessing the health of freshwater mollusks. The first morning of this Workshop will include a lecture overview of disease organisms, the current state of knowledge on freshwater mollusk diseases, and lessons learned from marine bivalve culture. The afternoon session that day will include small panel presentations on health assessment tools, mollusk die-offs and kills, and risk assessment of disease in mussel conservation activities. During the following two days, participants will rotate in small groups among three sessions:

1) laboratory techniques, mussel histology, and necropsy [held at the US Fish and Wildlife Service (USFWS) La Crosse Fish Health Center],
2) case studies on mussel and snail die-offs and development of response protocols, and
3) risk assessment of mussel and snail propagation and relocation activities.

The Workshop also will include a poster session, evening mixers with a jam session one night, and a separate opportunity -- on Thursday, March 15 -- to tour the USFWS Genoa National Fish Hatchery Mussel Propagation Facility.

Organizers & Presenters:

The Workshop is being organized by Diane Waller, US Geological Survey Upper Midwest Environmental Sciences Center, Megan Bradley, USFWS Genoa National Fish Hatchery (Mussel Propagation Team), and members of the USFWS Midwest Fishery Resource Office and Fish Health Center. A variety of experts on aquatic animal disease will be facilitating the Workshop sessions. The full list of presenters will be added to the FMCS 2018 Workshop webpage (http://molluskconservation.org/EVENTS/2018Workshop/2018Workshop.html) as details of the sessions are finalized.

Location:

This Workshop will be held at the Radisson Conference Center in La Crosse, Wisconsin. Lodging will occur at the adjacent Radisson La Crosse Hotel (https://www.radisson.com/la-crosse-hotel-wi-54601/la_cross). This conference facility and hotel are located on the banks of the Mississippi River in the heart of downtown La Crosse. The La Crosse Municipal airport receives service from Chicago O'Hare and Minneapolis International airports, and the Radisson hotel provides free shuttle service from the La Crosse airport. By car, La Crosse is a 2 ½ hour drive from Minneapolis and 4 hours from Chicago and Des Moines. Each day during the Workshop, transportation will be provided from the Conference Center to the La Crosse Fish Health Center.

Registration:

More details about the Workshop and the registration form will be posted soon on the webpage (http://molluskconservation.org/EVENTS/2018Workshop/2018Workshop.html). Early **registration** will **open** on **November 17, 2017**, and will **close** on **January 19, 2018**. No more than 120 registrants can be accepted for the Workshop due to laboratory space limitations. Late registration will occur online and at the Radisson Conference Center if slots are still available.

Poster Session:

A poster session will be held in conjunction with the Workshop on Tuesday evening, March 13. See the Call for Abstracts on the Workshop web page for details on poster and abstract formats. **Abstracts** will be **accepted** from **September 15, 2017** until **January 12, 2018**, and should be emailed in Word format to megan_bradley@fws.gov.

Sponsorships:

Donations from sponsors for this Workshop could substantially reduce the registration fee and help cover the costs of facilities and supplies. Sponsorship levels are the same as they have been for past FMCS events (see table, below). Also as before, all sponsor contributions will include recognition in the program and on the website. To make a donation, please contact FMCS Treasurer, Emily Grossman at egrossman@ecologicalspecialists.com or fill out the form available on the Workshop page on the website.

All Sponsor Contributions Include Recognition in the Workshop Program		
River	≥$1000	One complimentary registration, Logo on website Registration Page
Stream	$500-$999	One registration reduced by 25%, Logo displayed at the Welcome Mixer, Logo on Website Registration Page
Eddy	$100-$499	Logo on website Registration Page

If you would like to assist with this Workshop or have questions about its scope or content, please contact Diane Waller (dwaller@usgs.gov) or Megan Bradley (megan_bradley@fws.gov).

Society News

2018 FMCS International Meeting in Europe

The first FMCS International Freshwater Mollusk Meeting will be held on 16--20 September 2018, in the Theater Maggiore in Verbania, Italy. The Local Committee has begun planning for four days of presentations on a variety of topics that will cover all aspects of freshwater Malacology, targeting the latest research advances in both theoretical and applied issues. A number of internationally-recognized keynote speakers will present the state of current research on these topics and, we expect, will spark debate and interest on research needs concerning the many ways mollusks affect society and ecosystems.

More detailed information about the meeting and a list of its sessions will be posted soon on the FMCS Events Page (http://molluskconservation.org/Events.html). You can help promote this International Meeting by printing the next two pages of this newsletter as a front-and-back handout to share with your friends and administrators. For the moment, we count on everyone's enthusiasm to build a solid foundation for this bridge, the first among many future bridges that FMCS can build among freshwater malacologists around the world.

First Freshwater Mollusk Conservation Society International Meeting in Europe

Bridging the gap between freshwater mollusk research and conservation in the Old and New Worlds

First Announcement

Deadlines:

Abstract submission: 30 April 2018
Early registration: 30 April 2018
Late registration: 31 July 2018

First Freshwater Mollusk Conservation Society International Meeting in Europe

Conservation of freshwater mollusks is essential to maintain the important ecosystem functions and services they provide. Nonetheless, they are at risk as evidenced by their rapid and extensive global decline due to multiple causes, mainly of anthropic origin. Conservation strategies to stop this negative trend and maximize current biodiversity are urgently needed but are hampered by the lack of key information. Although in recent decades there have been an increasing number of studies on the ecology and conservation of these animals, the integration of knowledge acquired by different research groups is a key step for improving our efforts. Such integration would also help policy makers establish guidelines which can be applied in conservation management of these animals and their natural habitats.

The Freshwater Mollusk Conservation Society (FMCS) can be a reference for everyone but, to date, the Society is primarily serving members in the United States and Canada. This recognition prompted the idea of expanding the Society's role on other continents, starting in Europe. Europe has been chosen because of the large number of active freshwater malacologists working in a number of countries. The organization of a FMCS Meeting outside of North America aims to expand the membership, share research and data with international colleagues, and foster wider collaboration. It is under this perspective that we want to introduce the upcoming 2018 meeting in Italy – hopefully, the first of a series of FMCS-sponsored international meetings.

The goals of this first international meeting are:

1. To start bringing together international experts in the biology and conservation of freshwater mollusks that will create a network of knowledge with the final goal of developing collaborative projects and, eventually, global directives for the protection and conservation of this important faunal group.
2. To provide, with this first step, an incentive for non-North American freshwater malacologists to become members of FMCS and participate in planned activities, Symposia, publications, and Workshops.
3. To start organizing local malacologists -- e.g. initially from Europe, but to be expanded to other continents around the world -- to provide structure and communication about resources, questions, advocacy, and collaboration. This will facilitate developing techniques to address similar problems encountered across freshwater molluscan research.
4. To start holding international meetings focused on all freshwater mollusks around the world. The two recent international freshwater bivalve meetings (Bragança, Portugal in 2012 and Buffalo, New York in 2015) were both exciting and fun with good participation. With this 2018 meeting in Europe, we want to start building an international network that includes all freshwater mollusks.

Additional information about this International Meeting in Europe, the program, and how to register for it will be posted soon on the FMCS Events webpage http://molluskconservation.org/Events.html.

FMCS is Now a Member of CASS -- the Consortium of Aquatic Science Societies

Jeremy Tiemann, **Heidi Dunn**, **Braven Beaty**, and **Steve McMurray**

During our 2017 Symposium in Cleveland, the FMCS Board voted to join the Consortium of Aquatic Science Societies (CASS). This consortium was created to promote the advancement of knowledge about all aquatic sciences world-wide: from headwaters, through rivers and estuaries, and into the marine environments. Through collaboration and coordination among its member societies, CASS serves as an outlet for science-based discussions and statements on public policy issues that affect aquatic resources, in addition to promoting education for a better-informed general public.

At the time we joined, CASS membership included the American Fisheries Society (AFS), Association for the Sciences of Limnology and Oceanography (ASLO), Coastal and Estuarine Research Federation (CERF), Phycological Society of America (PSA), Society for Freshwater Science (SFS), and Society of Wetland Scientists (SWS). Since then, the International Association for Great Lakes Research (IAGLR) and the North American Lake Management Society (NALMS) have joined, giving CASS a voice representing about 20,000 aquatic scientists.

As laid out in the CASS memorandum of understanding (http://molluskconservation.org/Library/pdf/CASS%20MOU.pdf), the presidents and designated representatives of each member society serve as the voices for their societies. The authors of this article are now serving in this role for FMCS. CASS business is discussed during monthly conference calls, including the planning for any CASS-sponsored projects and events.

An example of a CASS-organized collaboration is the series of recent letters and briefs the Consortium has sent on the proposed US Government repeal of the Clean Water Rule (Waters of the United States Rule) that would affect the protection of wetlands (http://molluskconservation.org/Library/pdf/CASS%20WOTUS.pdf). Given the short response time involved, FMCS leadership did not feel we had the scientific knowledge to make a formal statement regarding the importance of wetlands to freshwater mollusks. We did know that this proposed change could degrade the stream ecosystems on which many freshwater mollusks depend and, therefore, agreed to add FMCS to the list of societies taking a position on the issue.

We recognize there could be instances when FMCS would decide to abstain from some issue, as well as cases when FMCS would lead the charge. As a member of this consortium, we could bring in the support of the other CASS member societies on issues we identify as important to aquatic mollusks and their habitats. The strength of that support would be far greater than any comments we could make on our own.

We believe that the conservation of freshwater mollusks and the other interests of FMCS will benefit from our membership in this consortium. If you have any questions about CASS, the role our Society may have in it, or know of an issue you would like to see CASS address, please contact one of us.

Minutes of the Summer 2017 FMCS Board Meeting via Teleconference, August 4, 2017

Call to order was made by President Heidi Dunn. In attendance were: Heidi Dunn, Janet Clayton, Jeremy Tiemann, Rachael Hoch, Megan Bradley, Emy Monroe, Kevin Roe, John Harris, Tim Lane**,** Nathan Eckert, Greg Cope, Arthur Bogan, and John Jenkinson. The declaration of quorum was established.

A motion to approve the minutes of the March 26, 2017 Board Meeting (published in the June 2017 *Ellipsaria*) was made by Greg Cope and seconded by Arthur Bogan. All approved.

Treasurer's Report – in the absence of Treasurer Emily Grossman, Heidi Dunn presented her submitted report.

2017 Symposium recap

As many probably heard, the symposium went great! We had nearly 300 people in attendance and 17 sponsors (as always, a huge thank you to those who sponsored!)

Symposium Income	
Registrations	$103,687.50
Sponsorships	13,102.00
Workshops	6,300.00
Field trips	2,100.00
T-shirts, etc.	4,297.00
Total Symposium income	$129,486.50
Total Symposium expenses:	$121,803.91

Happy to report we came out nearly $7,700 ahead this year. Thanks to all who helped out with the symposium!

Student awards update

Nine student awards were presented at this year's symposium; total expenses were $4,867.26. We had fantastic support during the 2017 auction and raffle, and brought in $7,573! We have been tracking student award expenses and auction/raffle income for the past several years, and currently have about $12,500 accrued to use toward student awards at the next meeting (and beyond!).

Other income and expenses 3/23/17 – 7/31/17

Income	
Memberships	$2,000.00
Past years t-shirts, hats, etc.	984.00
Interest	41.91
Total non-symposium income	$3,025.91
Expenses	
Allen Press/FMBC costs	$4,586.47
Webpage	4,612.08
(includes Sophie's annual charges + Wild Apricot [membership database] annual charge)	
Vests	536.77
Office supplies	210.20
(most of this was the purchase of Quickbooks for Windows)	
PayPal/Square fees & misc.	612.00
Total non-symposium expenses	$10,557.52

Current bank balance	
Checking	$32,259.86
Savings	125,040.18
PayPal	532.42
Total	$157,832.46

And a quick note: I received a membership check in the mail the other day from a couple in Oregon who had heard of FMCS through Abbie Gascho Landis' book *Immersion* (Abbie was present at the symposium and presented some of the book, and her experiences, during the sessions). They felt the work that FMCS does is valuable and asked to be enrolled as members to contribute. Thought that was pretty cool! I have emailed Abbie to share with her as well.

Rachael Hoch mentioned that she had heard someone was selling the book through an FMCS-sponsored site and they were charging a 20% tax. [Likely from the publisher; an email went out when the book was released.] Heidi will check into it. She was not aware of any such site and noted that we are not allowed to "sell" anything for a profit, so we cannot charge tax. We accept donations for items. We are not selling anything through our website.

Motion was made by Kevin Roe and seconded by Rachael Hoch to accept the Treasurer's report. All approved.

Secretary's Report –Janet Clayton

There are currently 563 individuals on the mailing list. Of those, 403 are active including 74 students and 18 lifetime members. The lifetime members, excluding Sophie Binder our website administrator, are the Lifetime Achievement Award winners. This list was recently reviewed and updated as several members were found to have been missing. There are a few names on the mailing list that consistently have emails returned.

Old Business

Update on AFS monetary values of fish and freshwater mussels – Heidi Dunn, Rachael Hoch

The document went to the publisher yesterday. All genera are based on the upcoming Williams et al. paper to be published in FMBC. Changes in Chapter 5 include deleting most of the methods section and referring to state protocols or Strayer and Smith. The new chapter just provides a list of recommendations. It emphasizes checking with local state and federal authorities. In the 2003 version of Chapter 6, mussels values were calculated for rearing juveniles to two months of age. Based on current literature, the submitted Chapter 6 provides values for rearing taggable size juveniles of greater than or equal to 20mm. The values have increased significantly but when compared to the extrapolated 2-month-old value, it was not that great of a change. Still, identifying and determining best practices for species for which little propagation work has been conducted, such as *Elliptio* species. The group decided to summarize values to the genus level to account for those species with limited information. Genera with no propagation efforts were grouped with other genera based on similarities in life history, propagation requirements, habitat, and distribution. Values are not provided for genera with all federally listed species (such as *Epioblasma*).

Heidi noted that, at the Cleveland Symposium, she formed an ad hoc committee which Megan Bradley agreed to chair. This new ad hoc committee will address needs for future updates so when the next update is conducted, we will not be behind the eight ball.

Update on CASS – Jeremy Tiemann

In April, FMCS became an official member of the Consortium of Aquatic Science Societies (CASS) which now has approximately nine member societies. One of the primary objectives of the consortium is to inform policy makers and the public on issues. An example is President

Trump trying to revoke the Wetlands Rule affecting headwater streams. The American Fisheries Society (AFS) and Society of Freshwater Sciences (SFS) took the lead, and reached out and asked if societies would comment on it. FMCS did not feel we had the expertise to comment, but indicated we would support it. Another issue coming up is on defunding the USGS library. Jeremy will be providing further information on CASS in *Ellipsaria* (That article is on Page 6).

Diversity/Inclusiveness Issue – Heidi Dunn, Jeremy Tiemann

Heidi plans to form an ad hoc committee to see what other societies are doing on the issue of promoting diversity and encourging the inclusion of all interested people. AFS is struggling with it, as well as CASS. Marybeth Brey, Kimberly Horndesky, Neil Ford, and Rachael Muir have all expressed interest in volunteering for the committee. Heidi would like the ad hoc committee to explore what we want to do with this issue and then form a plan. This could become a subcommittee of another committee such as Outreach.

Kevin Roe said there is a Society for Advancing Chicanos/Hispanics and Native Americans in Science (SACNAS). They have a national meeting that brings together students. He said he would be happy to sit at an FMCS booth at SACNAS.

Heidi and Teresa Newton, along with several other FMCS members, attended the SFS meeting in June. They have a "Diversity and Inclusiveness" committee. The SFS statement reads:

> The SFS is inclusive and accepting of all people and built on tolerance, respect, and a welcoming spirit at all of our activities. We strive to actively promote diversity across all levels of our society including members, leaders, committees, and staff. We value a diverse community and believe it fosters a richer understanding of freshwater ecosystems and conservation of global freshwater resources.

Anyone interested in participating on this committee should contact Heidi at HDunn@ecologicalspecialists.com. She would like to have this ad hoc committee formed before the fall board meeting.

Ecosystem Services ad hoc committee – Heidi Dunn

Plans are to further discuss during the fall board meeting; however, Carla Atkinson (University of Alabama) has expressed interest in taking this on.

Certification Program ad hoc committee – Rebecca Winterringer was unable to attend the meeting but provided a written report on the Certification Program.

No significant updates to report on the certification program. Amanda Rosenberg did reach out to Steve McMullin (AFS) after the Cleveland meeting and his guidance is below.

- Be able to represent the wide range of interests in our organization, which can be difficult to fit in a one-size-fits-all certification. In that case, multiple specialist certifications may be more suitable. Consider the more atypical background of some of your members. Suggests at least a specialized certification for Aquaculture/Management/Ecology.
- We must identify what is truly *critical* for a mussel biologist to know.
- Keep the general education requirements fairly broad – detail may be too much.
- As the question "how meaningful is certification"? Look at the 2016 Special Issue of *Fisheries* (http://www.tandfonline.com/doi/abs/10.1080/03632415.2016.1199231).
- AFS is likely to be amenable to a certification partnership so that we can have an abbreviated version or a specialty that aligns with their current certification program (https://fisheries.org/membership/afs-certification/).
- It's important to have a recertification process to show continuing engagement in the profession. Ways to show this: continuing education courses, conferences, involvement in FMCS or other important organizations, teaching, etc. Can have a 'point' system.

- Folks in Bethesda AFS would be happy to talk with FMCS about how they administer the process.

New Business

Bylaws update time? – Heidi Dunn

Heidi has reviewed the FMCS bylaws to determine if they would support changes in committee structure that seems to be needed to implement the new strategy. Some committees no longer have tasks under the new strategy. The bylaws actually list the current committees and these need to be modified to be flexible with changes in the strategy over time. Hopefully by the fall meeting, the Executive Committee (ExCom) [the five elected officials of the Society: President, Past-President, President-Elect, Secretary, and Treasurer] can suggest potential changes to be considered. One idea is to have some standing business committees (i.e., symposium, awards, information exchange) and form other committees to meet the goals of the strategy. Another suggestion was to have a few broad standing committees with subcommittees to address specific issues. If committee chairs have any other suggestions, please bring to the attention of the ExCom.

Kevin Roe noted that some committees have objectives that are so broad. We don't want different committees addressing the same thing. He agreed with changing the bylaws so the ExCom can change things as needed.

Heidi ensured that they don't want to keep the committees from doing tasks they feel are important even if those tasks are not specifically listed in the strategy. Other changes that are needed in the bylaws include membership categories. Membership categories listed in the bylaws also need updating (like emeritus members and contributing members), particularly if we are considering a lifetime membership rate. The current bylaws also have Heidi as representative to secretary of state. This should be listed by position rather than individual's name. Please bring forward any other suggested changes so that they can be reviewed.

Meeting Code of Conduct – Heidi Dunn

Heidi noted that, in our current bylaws, an appropriate code of conduct is addressed for officers but not members. She suggested that a code for members also should be included. It was noted that SFS has a code of conduct posted in the front of their symposium registration packet. Symposium attendees have to agree to follow this code during the registration process and the code of conduct is printed in their program. It was decided that a policy on code of conduct that also addresses inclusiveness should be posted in *Ellipsaria*. Rachael Hoch further noted that the policy should include something on property damage. The SFS code of conduct is below. Heidi suggested we adopt something similar for our meetings and in our bylaws. Suggestions are welcome.

SFS Annual Meeting Code of Conduct

All members who registered for the 2017 conference agree to abide by the following Code of Conduct: The Society of Freshwater Science is an international scientific organization whose purpose is to promote further understanding of freshwater ecosystems and ecosystems at the interface between aquatic and terrestrial habitats. SFS members and authors of SFS publications are expected to adhere to the SFS Science-Based Policy and the SFS Statement of Ethics.

SFS meetings, open to SFS members and those interested in freshwater sciences, are among the most respected meetings in the freshwater science community. SFS is committed to providing a safe, productive and welcoming environment for all meeting participants and staff. All participants including, but not limited to, attendees, speakers, volunteers, exhibitors, SFS staff, service providers and others are expected to abide by this SFS Meetings Code of Conduct. This Code of Conduct applies to all SFS

meeting-related events including those sponsored by organizations other than SFS but held in conjunction with SFS events, in public or private facilities.

Expected Behavior

- Communicate openly with respect and consideration for others, valuing a diversity of views and opinions.
- Avoid personal attacks directed toward other attendees, participants, SFS staff and suppliers/vendors.
- Be mindful of your surroundings and of your fellow participants. Alert SFS staff if you notice a dangerous situation or someone is in distress.
- Respect the rules and policies of the meeting venue, hotels, SFS contracted facility, or any other venue.
- Request permission from speakers before recording or taking photographs during their presentation. Turn off any ringers or otherwise disrupting devices during oral or poster sessions.

Unacceptable Behavior

- It is important that our meeting be a place where no attendee or staff is ever belittled, criticized or made to feel unsafe.
- The following behavior will not be tolerated:
  - Harassment, intimidation or discrimination in any form
  - Physical, written, or verbal abuse of any attendee, speaker, volunteer, exhibitor, SFS staff member, service provider or other meeting guest.
- Examples of unacceptable behavior include, but are not limited to, verbal comments related to gender, sexual orientation, disability, physical appearance, body size, race, religion, national origin, inappropriate use of nudity and/or sexual images in public spaces or in presentations, threatening or stalking any attendee, speaker, volunteer, exhibitor, SFS staff member, service provider or other meeting guest.

Summer Meeting – Should we have one?

It is currently in our operations manual that a summer board meeting will be conducted. The board discussed whether there are issues that are really pressing that could not be addressed in the fall. In fact, the last two summer meetings were not held because a quorum was not established. Janet Newton made a motion that the summer formal board meeting be cancelled in lieu of the committees sending written reports to be published in *Ellipsaria*. Heidi seconded. All approved.

Other Items?

Rachael Hoch noted that the upcoming Southeastern Association of Fish and Wildlife Agencies (SEAFWA) includes a symposium on Aquatic At-Risk Species. The meeting will be held October 29 through November 1, 2017 in Louisville, KY. Additional information will be posted in *Ellipsaria* (See announcement on Page16).

Committee Reports

Symposium – Jeremy Tiemann, Charles Randklev, Diane Waller

Charles Randklev was unable to attend the Board Meeting but submitted the following report addressing the 2019 Symposium in Texas. Jeremy noted that they are still leaning towards San Antonio rather than Austin.

- We started pricing hotel options in downtown San Antonio. Price per room is still the same as what we presented in Cleveland; we just want to make sure we're getting competitive rates. The plan is to visit hotels in the next few months to meet the staff and walk thru the facilities.
- We've added a few more folks to help with planning and to spread the workload.

- I've been contacted by various FMCS committees (e.g. student/outreach) and plan to coordinate with them once we lock down dates and conference hotel. My plan is to include them in our monthly meetings.
- We're reviewing several options for conference promotional items. Jeremy recommended face covers, but mesh sampling bags and paddling hats are other suggestions. It's still early and we're open to any and all suggestions.
- Keynote speakers- the consensus is no more than three, with one of those folks being a researcher who focuses on gastropods. Katherine Perez will be finding/coordinating with this individual and, perhaps, hosting a special session on a related topic. I'm working to have Dr. Reed Noss (https://sciences.ucf.edu/biology/faculty/reed-noss/) speak at our symposium, but no promises.

Heidi asked Jeremy to have Charles put a notice on the website about the 2019 Symposium.

2018 Workshop

Diane Waller was unable to attend the Board meeting but submitted the following report in writing (Also, see the article on Page 1). Jeremy said they will be sending out requests for papers and posters soon.

- We conducted a walkthrough of the Radisson facilities on 6-21-17 and taste-tested appetizers for the evening social.
- Day 1 – we will use the big ballroom for projection on a big screen and pay to rent the large projector $200/day. Lunch will be set up and served in an adjacent room.
- The evening poster session and social will be held in the foyer area.
- Day 2 – Use the Wisconsin Room for smaller group. This room will also be available for the evening mixer and social.
- We discussed options for alcohol and registration table. The hotel will make a registration table available.
- We met with Dana Ecker at the La Crosse Chamber of Commerce office. She discussed having an information table in the lobby with registration and other options for tours and coupons. The chamber will provide lanyards and can print name tags if we want. She is checking into a source for beer glasses.
- Megan, Corey, Nathan and Diane met on 6-29-17 to discuss the walk through and options for the social.
- Corey will ask for a budget estimate from the Radisson based on: 150 people, coffee and breakfast both days, plated lunch on day 1, 8-10 appetizers per person + relish tray both nights, 3 ½ barrels of beer, 12 bottles of wine/night, a bartender, and AV rental.
- The facility rental is $900 (ballroom on day 1, Wisconsin room on day 2).
- We are still waiting for an adjusted price estimate for the addition of another ½ day on Wednesday.
- A bus company was contacted and a 56-passenger bus is reserved for 3/14/18 and 3/15/18. Payment is due 30 days prior. They are sending a contract to sign.
- Draft Workshop Outline [presented in the article on Page 1]
- Each small group session will need: session leader, note keeper/data keeper, facilitator.
- We would plan to have the proceedings from the workshop published.
- An updated budget estimate will be prepared by August 31 to determine registration costs. The target for opening registration is early November, including abstract submissions for the poster session.

- A submission will be prepared by August 10 for the next issue of Ellipsaria to provide details and information on the workshop.

Megan followed up that they hope to have a couple local musicians, and have attendees bring instruments for an FMCS Jam. Local beer will also be available.

No one has stepped forward to host a 2020 Workshop. The Pacific Northwest is still on board for a Symposium in 2021.

Arthur Bogan noted nothing new to report on the Italy meeting. Nicoletta Riccardi will submit something for the upcoming issue of *Ellipsaria* (See article on Page 3).

Environmental Quality and Affairs - Steve McMurray, Braven Beaty, absent and no report

Genetics – Dave Zanatta, Kevin Roe

The committee discussed and agreed with the goals and statements in the revised National Strategy. We also decided that the Genetics Committee would seek to be more integrated with other committees/groups within FMCS to ensure that genetic and evolutionary aspects were being incorporated and considered by all groups in their conservation and recovery actions.

Kevin Roe has put together a small bibliography for the Propagation Committee on genetics issues that should be addressed in propagation and restoration.

Information Exchange – Greg Cope, Wendell Haag, David Berg, John Jenkinson

Founding Co-Editor of the Journal Dr. Tom Watters of Ohio State University has completed his term on the Editorial Board. He will transition off the Board after the publication of Volume 20, Issue 2 that will be completed in late September/early October 2017. We anticipate having 6-7 articles in this upcoming issue. Dr. David Berg of Miami University, Ohio has graciously agreed to accept the position of Co-Editor filling the slot vacated by Dr. Watters. We thank Dr. Watters for his long and dedicated service to the Journal and Dr. Berg for his willingness to take on this role. Drs. Wendell Haag and Greg Cope will remain on the Board in their roles as Co-Editor for the remainder of their terms and look forward to working with Dr. Berg.

E-mail messages were sent by Co-Editor Cope to the existing Editorial Board Members to see if they were willing to continue service, recommend others, or wish to rotate off. The response has been outstanding, with most agreeing to continue service for another 2-year term. In addition, following the previously stated need to expand the Editorial Board membership, e-mail messages were sent by Co-Editor Cope to seven individuals who had expressed interest in serving on the Board. We are pleased to welcome the following individuals: Heather Galbraith, US Geological Survey, Leetown Science Center; Stephen McMurray, Missouri Department of Conservation; Peter Hazelton, Massachusetts Division of Fisheries & Wildlife; Russell Minton, University of Houston Clear Lake; Manuel Lopes-Lima, CIBIO/InBIO, University of Porto, Portugal; Kathryn Perez, University of Texas Rio Grande Valley; and Ryan Prosser, University of Guelph, Canada. The final listing of the new and remaining Editorial Board members will be finalized, updated on the Journal's web site, and in the front matter of Volume 21, Issue 1.

The previously discussed application to BioOne for potential inclusion in their journal holdings for library distribution has not been completed to date.

John Jenkinson reported that the very large June issue of *Ellipsaria* was posted on schedule. Collection of material for the September issue already has begun and all additional input for that issue will be due by Tuesday August 15.

Mussel Status and Distribution – Arthur Bogan, John Harris

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. N.d. A Revised list of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the continental United States and Canada. *Freshwater Mollusk Biology and Conservation*. In press 31 July 2017. This manuscript covers taxonomy and nomenclatural issues, and is an update of Turgeon *et al*. 1998. It is now in press and will appear in the next issue of FMBC early this fall. Changes to the name list will be reviewed every two years.

2. Following substantive comments from the editor and reviewers in December 2015, it was decided that the update to Williams et al 1993 should be divided in two parts; the taxonomy and nomenclatural issues of which are addressed in the article discussed above. Renewed work will begin shortly on the conservation assessment manuscript. The major hurdle facing the conservation status manuscript is to devise a system to evaluate conservation status of species across a broad geographic area. This was the most critical comment from reviewers of the initial conservation status manuscript. The fact that there were no well-defined methods (metrics) to support status determinations was a major criticism. While that's a valid point, there's no simple solution. Nevertheless, we will attempt to better standardize our techniques of evaluation to make them more compatible across the US, Canada, and Mexico.

   Going forward, 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 (SGCN - species of greatest conservation need), 3) Revise and update distribution and conservation status information and complete the text revision from the previous submission, and 4) submit the conservation manuscript to Freshwater Mollusk Biology and Conservation.

3. Development of Mussel ID App - Susan Oetker

   Revisions to the app character matrix are complete and the development team is now reviewing and testing the app as we continue to improve and augment the photo archive and illustrations. Nate Johnson (and others) provided the app to attendees at a mussel identification workshop in June 2017 and results were much improved over previous testing at workshops in Texas. Additional funding has been received through ESA Section 6 to the state of Texas. When those contracts are finalized, the app developer will be ready to release a new build for peer review and testing. Final guidance for a revised version will be provided to the developer during a September 2017 conference call.

4. Atlas of Freshwater Mussels of North America

   Currently, 159 of the approximately 362 taxa addressed in the Atlas have volunteer authors for species accounts. As of March 21, 2017, we have received 22 first draft accounts. External review and subsequent revisions are complete for one species, and that account is posted to the website. We are proceeding with preliminary and external reviews of the remaining draft species accounts and will post those as they are completed.

Propagation, restoration, reintroduction – Rachael Hoch, Nathan Eckert, Tim Lane

The committee is continuing to maintain a propagation/stocking/relocation database. Any facilities actively propagating freshwater mollusks are encouraged to contact Rachael Hoch to add their contact information to the facilities database. The committee plans to update the propagation and restoration activities summary this fall. New facilities in database include Texas and some folks from Canada interested in joining.

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 (to work with USFWS's new book for the NCTC propagation course), (2) translocation and handling, (3) quarantine and biosecurity, (4) health and disease, hope to work with disease workshop, (5) restoration planning, hope to use existing plans such as the Cumberlandian and Mobile plans and (6) genetic guidelines, working with Kevin Roe.

Committee members are currently discussing the size and structure of the Propagation, Restoration, and Introduction Committee with the FMCS Executive Committee. With over 50 members in attendance at the 2017 FMCS Symposium committee meeting, the group identified the need to evaluate the committee structure and goals.

After asking for any more business and hearing none, Heidi Dunn made a motion to adjourn. That motion was seconded by KevinRoe. All approved.

Respectfully submitted, Janet L. Clayton, FMCS Secretary

Inaugural FMCS Student/Professional Mixer Follow-up

The Outreach Committee conducted a student/professional mixer at the 2017 Symposium in Cleveland. This event was designed to connect newer Society members and established professionals. After the meeting, the committee conducted a follow-up survey to gauge reactions to the event and to guide planning of future mixers. Thirty-six respondents comprised of 12 students and 24 professionals gave positive remarks for this event overall. All responses indicated that the Society should continue to hold these events and that Society members would be likely to attend. Ninety-two percent of respondents said the mixer was valuable to them in some way. Many responses contained specific thoughts on how to improve the event, for which we are thankful. The Outreach Committee is planning on holding another mixer at the 2019 meeting in Texas and will be coordinating with the 2019 planning committee. Any further suggestions for the continuation of this event are welcome and can be directed to Dan Symonds (symonds.13@osu.edu) or Amy Maynard (amy.maynard@dgif.virginia.gov).

Announcements

David H. Stansbery Passes Away

Dr. David Stansbery, former Curator of Mollusks at The Ohio State University Museum of Biological Diversity, was a mentor, important resource, and friend to many founding members of this Society. He also was the first recipient of our Lifetime Achievement Award (in 1999). He was 91 when he passed away on August 24, 2017. His newspaper obituary is available at http://www.legacy.com/obituaries/name/david-stansbery-obituary?pid=1000000186484817. If his Malacological Obituary and Bibliography are not posted in *Ellipsaria*, that source will be identified in this newsletter.

Southeastern Association of Fish and Wildlife Agencies Conference
October 29 – November 1, 2017 Louisville, Kentucky

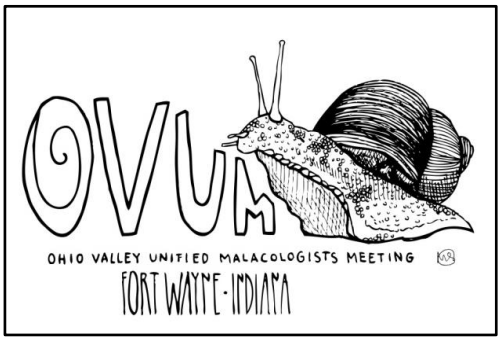
The Southeastern Association of Fish and Wildlife Agencies (SEAFWA) will hold its 71st Annual Conference, "Creative Conservation Strategies for 21st Century Challenges" at the Galt House Hotel in Louisville, Kentucky, on October 29 -- November 1, 2017. Seven special symposia will be held during the conference, including a symposium on Aquatic At-Risk Species. More information about the conference can be found at http://www.seafwa.org/conference/overview/ . The titles and abstracts for the Aquatic Species at Risk symposium are posted at https://seafwa2017.sched.com/overview/type/Symposia-07%3A+Aquatic+At-Risk+Species .

Meeting Announcement – OVUM XI
28 October 2017 Fort Wayne, Indiana

Achatz Hall of Science, University of Saint Francis, 2701 Spring Street, Fort Wayne, Indiana 46808
Host: Warren Pryor (wpryor@sf.edu)

The Ohio Valley Unified Malacologists (OVUM) have organized annual one-day meetings since the group was founded by Francisco Borrero and Tim Pearce in 1997. There are no dues, officers, abstracts, bylaws or publications. It provides a friendly, inexpensive forum for professional and amateur students of mollusks to share with each other their results and ideas. Participants are encouraged to present their science, but active listening and insightful questions are extremely valuable, too. Posters are also welcome. Giving a presentation or a poster are not requisites for attending.

The Eleventh Annual OVUM meeting will occur in the ballroom of the recently renovated Brookside Mansion on the University of Saint Francis main campus. Register for the meeting or obtain additional information by sending an email to wpryor@sf.edu. Information about overnight accommodations is available at http://www.visitfortwayne.com/hotels/.



Tentative schedule:

- 8 AM - Meet and greet with hot beverages and pastry
- 9 AM - Morning session
- Noon - Lunch
- 1 PM - Afternoon session (including posters)
- 5 PM - Farewells

Here are just a few selected presentations from past OVUM meetings:

Gettleman A. 2016. Hanging by a thread – Annulariid hanging behavior in Cuba, Jamaica, and the Dominican Republic.

McGregor MA & Cravens D. 2016. Restoration and management of freshwater mussels in Kentucky.

Borrero FJ. 2010. Systematic and biogeographic relationships of the land snail fauna of northern South America. Notes on some Pleurodontidae of the Sierra Nevada de Santa Marta, Columbia, with a new species of *Isomeria.*

Barrett A. 2013. Radioisotopes and nutrition in freshwater mussels.

Watters GT. 2010. Columbus Zoo and Aquarium Freshwater Mussel Conservation and Research Center

Kuehnl KF. 2010. A state of some unionids address: phylogenetic relationships in an imperiled group of freshwater mussels (genus *Villosa*)

Pearce TA & Arnold CD. 2016. Why is the tiger snail, *Anguispira alternata* declining in Pennsylvania?

Upcoming Meetings

September 10 – 14, 2017 – 8th European Congress of Malacological Societies, Kraków University of Technology, Kraków, Poland. http://www.euromal.pl/

October 29 – November 1, 2017 -- Southeastern Association of Fish and Wildlife Agencies 71st Annual Conference, Galt House Hotel, Louisville, Kentucky, USA. Theme: *Creative Conservation Strategies for 21st Century Challenges* http://www.seafwa.org/conference/overview/

March 12 – 15, 2018 – FMCS Workshop, Mollusk Health and Disease Workshop, Radisson Conference Center, La Crosse, Wisconsin, USA. http://molluskconservation.org/EVENTS/2018Workshop/2018Workshop.html

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/

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* http://molluskconservation.org/Events.html

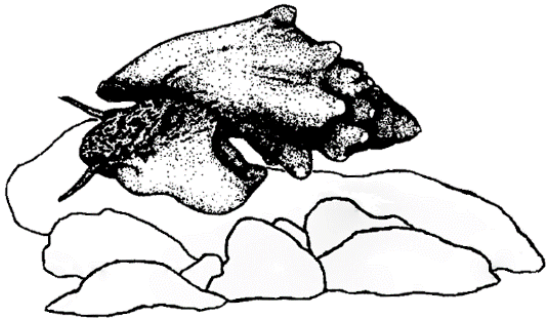
March 18 – 22, 2018 – National Shellfisheries Association 110th Annual Meeting, Renaissance Hotel, Seattle, Washington, USA Theme: [not posted] https://shellfish.memberclicks.net/annual-meeting

May 20 – 24, 20118 – Society for Freshwater Science Annual Meeting, Detroit, Michigan, USA Theme: *Navigating Boundaries in Freshwater Science* http://sfsannualmeeting.org/

July ? – ?, 2018 – American Malacological Society 84th Annual Meeting, [Dates, Location, and Theme not yet posted] http://www.malacological.org

August 19 – 23, 2018 – American Fisheries Society 148th Annual Meeting, Atlantic City, New Jersey, USA Theme: *[*not yet posted*]* http://fisheries.org/events-page/future-afs-meetings/

March 2019 – FMCS Symposium, San Antonio, Texas, USA. Theme: *Life on the Edge: Reconciling River Management.* Other details not yet determined.



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.*

Cumberlandia monodonta – Host Enigma Resolved

Bernard Sietman[1], **Mike Davis**[1], **Mark Hove**[2], **Madeline Pletta**[1], **Tricia Wagner**[1], **Shelby Marr**[1], **Zebulin Secrist**[1], **Morgan Freeburg**[1], **Anna Scheunemann**[1], **Kelsey Krupp**[1], **Emory Hagemeyer**[1], **Alex Franzen**[2], **Cameron Swanson**[2], and **Avery Sampson**[2]

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[2] University of Minnesota, 2003 Upper Buford Circle, St. Paul, 55108

Finding the larval host for the federally endangered spectaclecase, *Cumberlandia monodonta*, has been among the longest and most challenging searches for any freshwater mussel species. High levels of genetic variation and low variation among populations suggest spectaclecase has a highly mobile host (Inoue et al. 2013). Over 50 species of fishes (Baird 2000, Haag 2012) and other aquatic animals (Hove et al. 2009) have been tested for host suitability without success.

The St. Croix River below St. Croix Falls dam, Minnesota and Wisconsin, has one of the largest remaining reproducing populations of spectaclecase; however, populations above the dam are non-recruiting and declining toward extirpation (Minnesota DNR, unpublished data). This hydroelectric dam is a complete barrier to fish movement, suggesting the host for spectaclecase is extirpated above the dam. By comparing recent and historical fish assemblages above and below the dam, we made a list of potential species that had not been previously tested for host suitability. Among these were American eel (*Anguilla rostrata*), mooneye (*Hiodon tergisus*), and goldeye (*Hiodon alosoides*), all of which are highly mobile.

To examine these species for host suitability, we obtained American eels from the Atlantic slope drainage and lower Mississippi River, goldeye from the Red River of the North, and mooneye from Pool 4 on the Mississippi River. Gravid spectaclecase were collected from the St. Croix River in mid-May - early June 2015 - 2017. Using standard protocols (Hove et al. 2016), we inoculated fishes by combining them with larvae in an aerated water bath. To determine if mooneye is a host under natural conditions, we collected individuals of the species from the St. Croix River adjacent to spectaclecase colonies during the latter part and shortly after the larval brooding period. Fishes were held in species-specific tanks, and settled materials from the tank floors were filtered and checked periodically for juvenile mussels. Gills of fish that died during a trial were examined for attached larvae. If larvae were present, the gills were removed, placed in aquaria, and the tank filtrate was frequently checked for juvenile mussels (Bloodsworth et al. 2013).

We recovered fully transformed juvenile spectaclecase from laboratory-infected mooneye and goldeye, and naturally-infected mooneye (Figure 1). Live juveniles were collected from tank filtrate holding live fish and from excised gills of dead fish (Table 1). In total, we recovered over 350,000 spectaclecase juveniles from 17 laboratory infected fish (goldeye and mooneye combined), and 2,790 juveniles from six naturally-infected mooneye. American eels failed to produce juvenile mussels and were considered unsuitable hosts for this species.

Spectaclecase grew considerably during transformation. The length of juveniles recovered from live laboratory inoculated fish was highly variable, ranging from about 95 to 250 µm. Juveniles recovered from naturally-infected mooneye were nearly identical in appearance to juveniles from laboratory trials, but those recovered soon after the fish were captured were larger (361 to 402 µm) and more inflated.

Juvenile spectaclecases were placed in indoor sediment culture tanks and enclosures in the Mississippi River to evaluate survival and growth. After 45 days in sediment culture, individuals ranged in length from 442 to 1402 µm.

The discovery of suitable hosts for spectaclecase is a critical step toward the recovery of this federally endangered species.

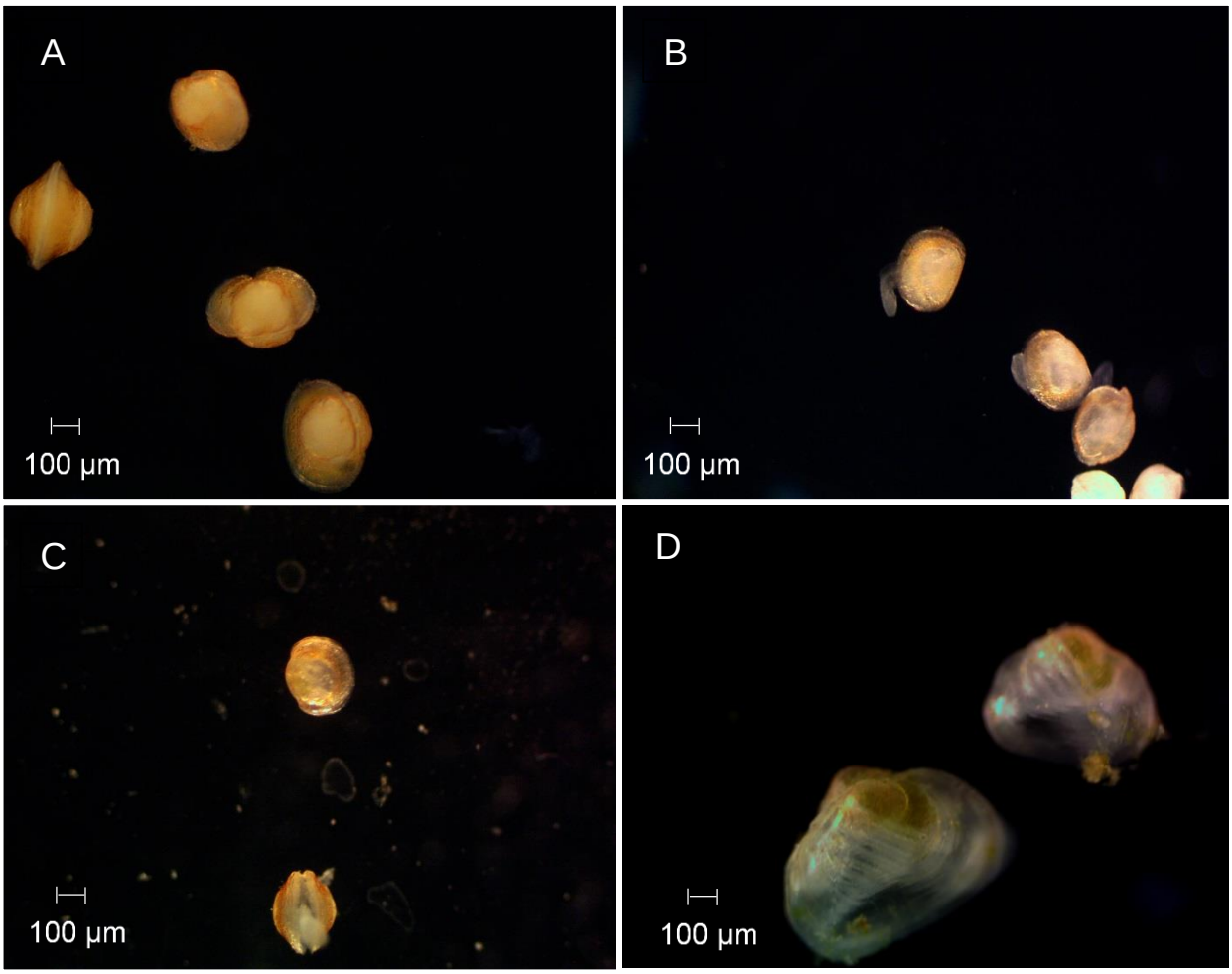

Figure 1. Juvenile *Cumberlandia monodonta* recovered from naturally-infected mooneye (A), laboratory-infected goldeye (B), laboratory-infected mooneye (C), and juveniles reared on sediment for 45 days (D).

Table 1. Summary of *Cumberlandia monodonta* host trials with successful juvenile transformation.

Fishes	Juveniles recovered from live fish	Juveniles recovered from excised gills	Number of fish/ Number of survivors
Laboratory-infected goldeye (*Hiodon alosoides*) Trial 1	1,035	140,000*	10 / 0
Trial 2	190,000*	2,361	7 / 6
Laboratory-infected mooneye (*Hiodon tergisus*) Trial 1	1,786	>12,000*	4 / 0
Naturally-infected mooneye (*Hiodon tergisus*)	329	2,461	6 / 2

* Estimates based on volumetric subsamples

Acknowledgements:

We thank Jamison Wendell, Dan Spence, Nick Schlesser, Joel Stiras, John Waters, Dennis Topp, Kevin Stauffer, Heather Galbraith, Quinton Phelps, Troy Howard, MJ Sahl, and Konrad Schmidt for assistance with collecting and transporting fishes; and Ben Minerich, Matt McLaughlin, Christoph Noetzli, and Jim Stoeckel for helpful advice on maintaining fish in captivity.

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The Brook Floater Working Group: A Collaborative Initiative Aimed at Regional Population Restoration and Conservation

Sean C. Sterrett[1] and **Allison Roy**[2]

[1] Massachusetts Cooperative Fish and Wildlife Research Unit, Department of Environmental Conservation, University of Massachusetts-Amherst ssterrett@umass.edu

[2] U.S. Geological Survey, Massachusetts Cooperative Fish and Wildlife Research Unit, University of Massachusetts-Amherst aroy@eco.umass.edu

The Brook Floater (*Alasmidonta varicosa* – Figure 1.) is a small (<75mm), stream dwelling unionid from Atlantic Slope drainages in the Eastern United States (Nadeau 2008, Wicklow et al. 2017). This species has recently been suspected of declines all across its range based on direct and indirect evidence related to habitat fragmentation, urbanization and agricultural runoff, among other threats (Wicklow et al. 2017). It is listed as a species of greatest conservation need (SGCN) in all of the states within its current range (14 states in total), has been extirpated from two states (Rhode Island and Delaware), and was petitioned for Federal listing in 2011 (Center for Biological Diversity 2011). Currently, there is a U.S. Fish and Wildlife (USFWS) Species Status Assessment underway to assess Brook Floater populations and threats and determine its federal listing status.

Figure 1. A Brook Floater found in the Nissitissit River in Massachusetts. Photograph by Ayla Doubleday.

The Brook Floater Working Group (BFWG) was formed in early 2017 as the result of a successful State Wildlife Grant (SWG). This Working Group, led by Allison Roy (University of Massachusetts-Amherst, U.S. Geological Survey and the Massachusetts Cooperative

Fish and Wildlife Research Unit) and Peter Hazelton (Massachusetts Division of Fisheries & Wildlife), has a primary objective of meeting the needs of the SWG, by developing a strategic conservation and restoration plan for the Brook Floater across its range. BFWG is a diverse group of managers and scientists from federal and state agencies and academic institutions who specialize in mussel ecology and management. Each state manager has identified specific management priorities for the Brook Floater within their state. We will use a structured decision-making approach to develop a strategic path forward for effective and efficient actions that will benefit Brook Floater. This approach also will contribute to an overarching goal of fostering cross-state and regional relationships among partners working on similar conservation problems. We hope that similar working groups are established for other listed mussel species with wide distributions.

Figure 2. Typical habitat for the Brook Floater in the West Branch Farmington River in Massachusetts. Photograph by Ayla Doubleday.

Among other focal items, BFWG has recently developed and is currently implementing a rapid assessment protocol for Brook Floater in six states. The protocol employs an occupancy framework, which uses randomly selected sites to draw inference on what proportion of sites within a watershed are occupied (Figure 2) while simultaneously estimating detection probability (MacKenzie et al. 2003). This approach accounts for low detection (MacKenzie et al. 2003), a major sampling bias associated with freshwater mussels. The goal of these surveys is to learn about the habitat factors that influence the distribution of Brook Floater and sampling factors that influence detection, which will inform future surveys. You can learn more about BFWG here: https://sterrett.wixsite.com/bfwg

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Unionicolan Mites and Freshwater Mussels and Snails

Malcolm F. Vidrine, Department of Sciences and Mathematics, Louisiana State University Eunice, Eunice, Louisiana 70535 (mvidrine@lsue.edu) (malcolmvidrine@yahoo.com)

Freshwater mussels and snails are colonized by many types of animals and are infected by a wide variety of parasites. In fact, Edwards and Vidrine (2013) describe mussel beds as environments similar to coral reefs, with numerous and varied relationships among members of more than a dozen animal

phyla interacting with the mussels. Both free-living and parasitic freshwater mites (Acari) are common members of these communities and, in a typical mussel bed, nearly 60 percent of the mussels are infected by unionicolan mites (Edwards and Vidrine 2013; Vidrine 1996a-e). Snails (Viviparidae and Pilidae) are also infected. In many ways, these mites act like ticks, but some associations are much more dynamic (McElwain et al. 2016).

Figure 1. *Unionicola tumida* (Wolcott) surrounded by three *Unionicola arcuata* (Wolcott) between the gills of a *Strophitus subvexus* (Conrad) from Twelve Mile Creek, St. Helena Parish, Louisiana.

Mitchell (1955, 1965) described as many as five mite species inhabiting a single mussel species in the genus *Lampsilis*, with each mite species living in a specific part of the mussel, therein partitioning the mussel resource (Figure 1). The variety of interrelationships between mussels and these mites appears to be unlimited.

While there is only one named species in the genus *Najadicola* (Pionidae: Najadicolinae) that is a mussel parasite, there are, so far, 141 named species of *Unionicola* (Unionicolidae: Unionicolinae) mussel parasites (Figure 2). The most recent discoveries involve recognizing cryptic mite species -- each species appears to be host-specific (Ernsting et al. 2014). It is now apparent that the mites are highly host-specific as I suggested some time ago (Vidrine 1980). This finding amps up the need for detailed study regarding the coevolution and cophylogeny of the mites and their mussel hosts.

Figure 2. *Unionicola ypsilophora* (Bonz). Photograph by Dale D. Edwards.

It is widely known that mussels and snails are in dire straits, mostly as a result of river modification and pollution. Similarly, the mites that parasitize mussels are likewise imperiled. To me, the disappearance of a population of freshwater mussels implies a concomitant loss of a community of mites infecting those mussels. In such circumstances, we are left with what I call 'forensic ecology,' where we imply what the diversity of a lost mite community might have looked like. Over the years, I have done a bit of that by inspecting collections of preserved mussels in search of their mite parasites and, in many cases, have discovered new mite species.

For years, Arthur E. Bogan, Daniel J. Bereza, Samuel L. F. Fuller and others have sent me mites from their curated collections and their field work. Those samples have helped unravel global issues, e. g., what types of mites occur in African mussels, and the great diversity of mites in Asian and South American mussels. The morphological diversity of these mites is sufficient to extend and redefine their evolutionary history and, possibly, that of the mussels in which they occur. With the advent of DNA analyses, the potential for the discovery of new mite species and new relationships with mussels is beyond my imagination.

The internet now makes it easy and inexpensive to share information about unionicolan mites with other members of the scientific community. The website I have created (www.unionicola.wordpress.com) is designed to present updated information on mite species, geographic and host ranges, historical and new research, and my thoughts on the evolution of these mites. As an initial effort, the site now contains diagnoses and illustrations of each of the species that infect freshwater mollusks and a pertinent bibliography. The effort is intended to not only stimulate interest in mussel-mite communities but also to encourage molecular research on the taxonomy of these mites. In many ways, we have reached a morphological research point of no return -- our morphological rubric for naming species only opens the discussion as to the complete identity of these mites. Cryptic species appear common and are only identifiable by molecular techniques and possibly host range. The site serves as a resource for identifying

the currently known/named species infecting mollusks, and I will gladly verify the identity of specimens to assist readers in efforts to study these mites.

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Defining Freshwater Mussel Species

Robert G. Howells, BioStudies, Kerrville, Texas

Even before Linnaeus developed binomial nomenclature in the 1700s, identification of animal and plant species and the assignment of widely accepted names was an area of confusion and disagreement. And, there have always been lumpers and splitters. The lumpers preferred to combine sometimes vast numbers of organisms under a common name as simply varied forms of the same thing. The splitters justified assigning a unique name to anything with so much as a tiny blemish on an appendage. Reality, of course, is usually somewhere in between.

Certain species groups sometimes seem driven to confound any scientist's attempts to define a species. Stickleback and salmonid fishes, for example, are extremely plastic and seem determined to challenge anything experts propose. Additionally, some of us suspect Mother Nature may have created unionids with the intent to really "mess with" taxonomists. Among the freshwater mussels, some forms defy identification regardless of what technique is used.

Efforts to create guidelines to formalize how to define a species have generally considered four major concepts:

Using the **Morphological Concept**, members of a species are defined based on as set of common physical features. This is the oldest and most-widely applied method; however, it can easily be confounded by situations of parallel evolution among otherwise unrelated organisms. Further, some features were often weighted heavily while others were ignored completely. In the case of unionids, we often saw historical authorities defining species wholly on the shells, discarding potentially-diagnostic soft tissue characters completely.

Biologists have long used taxonomic keys where a single feature in a single couplet leads to identification of an organism. More recently in the digital age, efforts have sought to simplify identifications by presenting a single photograph that will serve to name a specimen in question. Some mollusks like unionids; however, may be both morphologically variable and subject to loss of some features so that reliance on any one trait may be impossible. Yes, beak sculpture may be uniquely

diagnostic, but only if it is still present. Often, several traits need to be examined to find the one that can nail down an identification. Morphology alone has its limits.

The **Ecological or Biological Concept** requires species to be interbreeding or potentially interbreeding, reproductively isolated from other groups, and to occupy the same ecological niche. But, here too, there are exceptions. Some species cannot mate with all other members of their same species, may reproduce parthenogenically, may be morphologically distinct in different niches, or readily hybridize when the opportunity presents.

The **Evolutionary Concept** relies on members of a given species having a shared evolutionary history and a common ancestor. Though this seems self-evident, it can be open to significant levels of discussion or require advanced biochemical analysis.

Genetic Cluster Concept, the most recently developed approach, uses advanced biochemical methods and statistical analyses to group species by similarities and differences in their genetic make-up. Although DNA has opened many doors and helped explain numerous problems, some rely on it either too heavily or even exclusively to define what a species is. Others question if it is the panacea of taxonomic clarity we might have hoped.

Papers on modern genetic identifications often present multiple biochemical methods and several statistical approaches to data interpretation. These, in turn, allow the researchers to pick and choose the findings deemed most appropriate. Is this somewhat akin to past malacologists comparing shell features, but ignoring major soft tissue distinctions? Those of us that are not biochemically-literate may be left asking if DNA results are as definitive as we would hope.

Yet another concept, **Resource Management and Preservation**, might also need to be applied to how we define a "species" or, at least, a unique group worthy of preservation and management. In some places in western British Columbia, Black Bears produce white-colored individuals. These are only white Black Bears and not a distinct species. Still, does being the most abundant and widely distributed bear species in North America mean that these white populations should be treated with the same management and protection logic applied to Black Bears in general? Or, are these white Black Bears worthy of special consideration? This same logic might well be applied to freshwater mollusks. Even if a unique population is genetically shown to only be a form of a common, highly variable species, should they still deserve special consideration? Or, can we brand them unworthy of special protection and, perhaps, allow them to slip away?

With the development of DNA analyses, researchers sometimes sought to seek out potential cryptic species -- two or more species that are genetically distinct, but morphologically identical. More recently, there seems to be a significant lumping trend among some biochemists proposing to synonymize multiple previously-recognized species under a single name. Certainly, this is sometimes justified, but lumping can also be a tool to eliminate problems associated with rare forms with limited distributions. In the big picture, is this the best approach to maintaining ecological diversity?

In the 70s and 80s, I worked for an environmental consulting firm doing ecological impact work at oil refineries and power plants. At times, when our results found limited environmental harm, we were branded by some as 'biostitutes' who only said what we were paid to say. That was never exactly true, but one could understand the logic. When a nuclear power plant operator pays you tens of thousands of dollars to examine a situation and you report there isn't any problem, what are onlookers to conclude? Some mollusk studies today, including some addressing taxonomic issues, may risk falling under this same shadow. Do reported results reflect true scientific findings or were they influenced by the goals of the funding source? Some medical and other scientific journals now require funding and conflict-of-interest disclosures to accompany submitted papers because of this very concern.

In summary, I suggest that efforts to define unionid species and other identifiable or unique taxa should consider six major criteria: (1) morphologically similarity (allowing for age, sex, etc.); (2) interbreeding or potentially interbreeding (except extinct forms or special situations); (3) occupation of the same or similar niches; (4) evolution from a common ancestor; (5) shared biochemical composition; and (6) resource management, protection, and biodiversity issues. Trusting completely or too heavily on any one criterion might be ill advised. Finally, malacological publications may also benefit from requiring funding and conflict-of-interest reports that could identify sources which might have influenced the authors' findings and how those findings were interpreted.

On the Presence of the New Zealand Mudsnail *Potamopyrgus antipodarum* in Israel

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Fieldwork carried out by staff members of the Israel National Center for Aquatic Ecology (INAEC) in Upper Galilee, Israel, on 15 June 2015 resulted in the discovery of a freshwater snail apparently not seen before in Israel. After an initial sorting of the material by INAEC technicians, the molluscs were submitted for identification to the malacological team working in the Mollusc Collection of the Steinhardt Museum of Natural History (SMNH MO). The unknown snail species was immediately identified as belonging to *Potamopyrgus antipodarum*.

This invasive species of New Zealand origin was found living in an arm of the Dan River, just south of road # 99, immediately below the Dafna trout hatchery. Material has been permanently lodged in the Mollusc Collection (SMNH MO 80187), while additional specimens were retained in the INCAE-collection. A short report concerning this first record of *Potamopyrgus* from Israel was published in the local malacological journal *Triton* (Mienis *et al.* 2016).

Figure 1: *Potamopyrgus antipodarum* collected downstream of a trout hatchery in an arm of Nahal Dan near Dafna, Upper Galilee, Israel.

Until recently *Potamopyrgus antipodarum* was considered belonging to the Hydrobiidae, however, molecular investigations by Wilke *et al.* (2013) have shown that it belongs to the family Tateidae.

The small shells, height 4-5 mm, consist of 5-6 slowly increasing whorls which are of a yellowish-brown colour. Two types of shells are often encountered within a single population of *Potamopyrgus antipodarum*: completely smooth ones and those which show a weak carina bearing a single row of periostracal "spines". All the specimens collected near Dafna turned out to belong to the smooth type (Figure 1).

Potamopyrgus antipodarum differs from the various *Heleobia* species occurring in Israel by its somewhat broader shell, by the angular form of the upper part of the first whorl and by the continuous edge of the aperture. "Spiny" forms of *Potamopyrgus antipodarum* differ from spiny forms of another invasive species *Pyrgophorus* cf. *coronatus* (Pfeiffer, 1840) recorded from Israel and Jordan (Mienis *et al.*, 2011; Mienis, 2011a-b; Nasarat *et al.*, 2014) by the origin of the spines: in *Potamopyrgus* they are part of the periostracum covering the shell, while in *Pyrgophorus* the spines are an integral part of the shell. Besides, that shells of *Potamopyrgus* are smooth, while the upper part of each whorl in *Pyrgophorus* shows regular incised spiral lines.

Potamopyrgus antipodarum is a gastropod species native to New Zealand. In the middle of the 19th Century it turned up suddenly in England, but it lasted more than 30 years before it was described as a supposed new species as *Hydrobia jenkinsi* Smith 1889. In the next century, it did not invade more or less the whole of Europe (Warwick, 1969; Städler *et al.*, 2005), settled in Australia (Ponder, 1988), moved to North America (Benson *et al.*, 2016) and, most recently, to Chile in South America (Collado, 2014), while it has also been recorded from Japan (Shimada & Urabe, 2003).

In the Middle East, it is well-known from west and south Turkey (Gürlek, 2015), while most recently it has also been recorded from Iraq (Naser & Son, 2009), Iran (Sharifinia, 2015) and, closer to Israel, from Lebanon (Bössneck, 2011). The record from Cyprus by Demetropoulos & Hadjichristophorou, 1976 has

never been confirmed. So far it has not been recorded from Jordan or Syria, although Gürlek's new locality in Turkey is situated rather close to the border with Syria.

The sudden presence of this invasive species near Dafna raises the question: "How did it reach that location?" According to the literature, *Potamopyrgus* is easily transported to other areas not only by human mediated means like ballast water or the transfer of fish to hatcheries, but also by natural means like migrating birds (Zaranko *et al.*, 1997).

Ballast water is ruled out in the case of Dafna, but migrating aquatic birds might have served as the transporters of living specimens of *Potamopyrgus.* Cases are known that Hydrobiids, aquatic snails living often in the same way as *Potamopyrgus*, may survive passing the digestive tract of ducks and waders alive (Cadée, 2011; van Leeuwen *et al.* 2012). The area where *Potamopyrgus* was found in Israel is situated in one the major flight corridors of migrating birds in the Eastern part of the Mediterranean.

Even more likely, however, is the possibility that *Potamopyrgus antipodarum* was introduced to that arm of Nahal Dan with egg batches of foreign trout introduced to the hatchery in Dafna. This snail species was also introduced in this way into the Middle Snake River in Southern Idaho (Bowler, 1991).

Whatever the way of introduction might have been, we hope that it will not establish a population in the nearby Sea of Galilee. One invasive exotic gastropod: *Mieniplotia scabra* (Müller, 1774), Fam. Thiaridae, causing havoc in Israel's major source of drinking water: The Sea of Galilee, is more than enough.

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Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel *Sinanodonta woodiana*, 45. News from Austria, the Czech Republic, Poland, and Spain

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This time, information is forwarded concerning studies which mentioned the presence of the Chinese Pond mussel *Sinanodonta woodiana* (Lea, 1834) in Austria, the Czech Republic, Poland and Spain.

Austria

After consultation of reports concerning finds of large freshwater mussels in empty fishponds in Lower Austria on the internet, Reischütz (2017) was able to confirm the presence of Chinese Pond mussels in ponds near Hessendorf and the Jägerteich near Waidhofen, all in the Waldviertel. Some of these finds were confirmed by Frank (2017).

Czech Republic

An international team of Czech, Chinese, and Portuguese scientists (Donrovich *et al.*, 2017) studied the influence of *Sinanodonta woodiana* on the reproductive success of native mussel species. *Anodonta anatina*, the native Duck mussel, uses intensively the European chub *Squalus cephalus* as the host for their glochidia. Laboratory tests have shown, however, that when that fish species had a history of infections with glochidia of the Chinese Pond mussel, then the reproduction success of *Anodonta anatina* was notably reduced due to cross-resistance of the host fish. In another laboratory test with *Sinanodonta woodiana* and *Squalus cephalus* carried out by Douda *et al.* (2017) in the Czech Republic, they reached the conclusion that the glochidia released by the Chinese Pond mussel had a negative effect on the health of parasitized European chubs.

Poland

Three new localities of the Chinese Pond mussel were recorded by Spyra *et al.* (2016) from the south of Poland in the area of Dębowiec. All are fish ponds varying in depth of 1-1.5 m at either side of the river Knajka. In these fishponds, various species of Southeast Asian Carps are being cultivated. Information is provided concerning density, biometric parameters and age structure of the populations.

Most records of *Sinanodonta woodiana* in Poland are either from fish ponds or coolwater basins for power plants. Szlauer-Łukaszewska *et al.* (2017) mentioned this invasive mussel species from the Oder

River. During a period of prolonged drought, numerous specimens of the Chinese Pond mussels were seen in the lower reaches of the Oder River, where they share the habitat with several native freshwater mussels belonging to the Unionidae.

Spain

López-Soriano *et al.* (2017) reported several well-established populations of *Sinanodonta woodiana* from the delta of the Llobregat wetlands in Catalonia.

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Another Invader Among Us: First Confirmed Record of the Invasive Non-native Asian Clam *Corbicula fluminalis* (Müller, 1774) in Santa Catarina State, Southern Brazil

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On May 24, 2017, *Leonardo Kleba Lisboa*, a local professional limnologist, requested the identification of some bivalve mollusk specimens in several field photographs (Figure 1). Those photographs were of a small lot of fresh shells found in the Upper Chapecó River – an important tributary in the great Upper Uruguay River Basin -- between the Municipalities of São Domingos and Ipuaçu (Figure 2) The shells were found on the banks of the regional small hydroelectric power plant (Pequena Central Hidrelétrica/ PCH) Santa Luzia (Figure 3) and showed signs of predation by birds, most likely the malacofagous species popularly known as Limpkin, *Aramus guarauna* (Linnaeus, 1766).

The specimens in the lot examined were immediately confirmed by us as typical exotic invasive Asian basket clams Cyrenidae in the genus *Corbicula* Megerle von Mühlfeld, 1811, specifically the common *Corbicula largillierti* (Philippi, 1844) and, to our surprise, adult specimens of *Corbicula fluminalis* (Müller, 1774) (Figures 1 and 4).

This record of *Corbicula fluminalis* (Müller, 1774) is the first confirmed sighting of the species in the State territory. It is the third invasive Asian clam species known in Santa Catarina State/ SC and the fourth freshwater/ limnic non-native bivalve verified to occur here. Its presence raises to 235 the known

number of continental mollusks in this Brazilian geographical area, and to 25 the number of exotic and invasive forms that have been introduced here.

Recognized globally, invasive alien forms are the second major cause of extinction of native species, immediately behind the destruction of habitats by human intervention. Unfortunately, in Santa Catarina State/ SC, this worrisome situation is becoming increasingly evident. Once again, adding to the "historical sensitive and regrettable lack of interest" in basic malacological research in the State (Agudo-Padrón 2015:379), the future of our still little-known native and endemic species of continental mollusks is uncertain!

Figure 1. Exotic invasive Asian clam specimens found on May 24, 2017 in the Upper Chapecó River Basin: *Corbicula fluminalis* (Müller, 1774) (left photo) and *Corbicula largillierti* (Philippi, 1844) (right photo). Photographs by Leonardo Kleba Lisboa

Figure 2. Locations of the São Domingos (red) and Ipuaçu (blue) Municipal Districts in the Western geographical territory of Santa Catarina State/ SC.

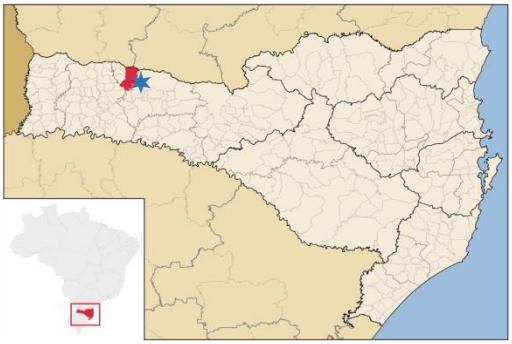

Figure 3. Views of the locality where the Asian clam specimens were found (left) in the Upper Chapecó River Basin and the regional small Santa Luzia hydroelectric power plant (right).

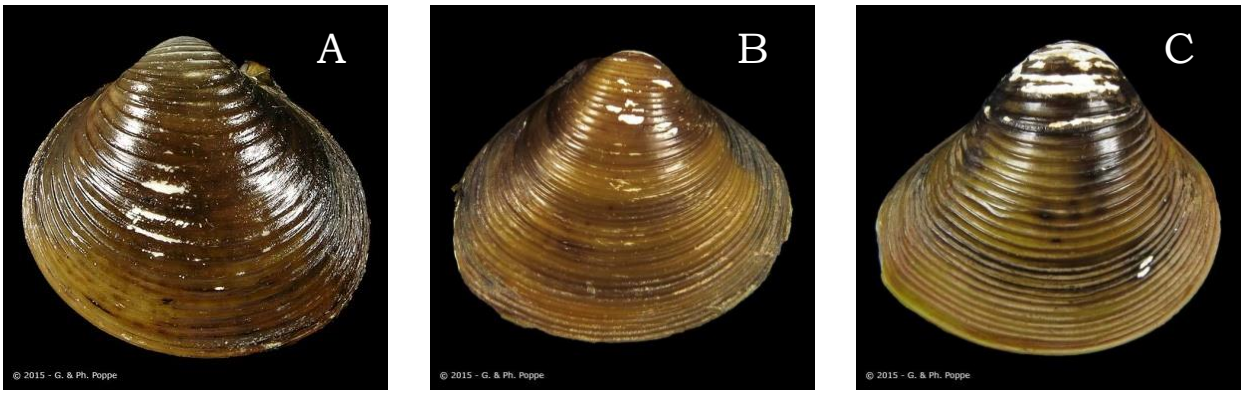

Figure 4. Simplified visual key to differentiate the three exotic species of the genus *Corbicula* Megerle von Mühlfeld, 1811 occurring in the State of Santa Catarina/ SC, Southern Brazil:
A – *Corbicula fluminea* (Müller,1774): shell with rostrum, robust but not inflated, with umbos high and not very centralized
B – *Corbicula largillierti* (Philippi, 1844): shell without rostrum, fragile and not inflated, with umbos low
C – *Corbicula fluminalis* (Müller, 1774): shell without rostrum, robust and inflated, with umbos high and centralized

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A Consolidated Mollusk Fauna Inventory of Santa Catarina State/ SC, Central Southern Brazil Region, with Two New Freshwater Geographical Records

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This is a brief analytical summary of the current state of our knowledge of continental mollusks in Santa Catarina State. This summary results from systematic researches conducted in a sustained way through the autonomous Brazilian "Project Avulsos Malacológicos - AM Project.," comprising up to the present a total of 21 years, from March 1996 to July 2017.

Main results achieved:

1. State biogeographic spatialization

Six established/ delimited malacological regions (Figure 1), four of them still in direct contact with the sea (sectors 2, 6, 1, 5), taking into account geophysical aspects of relief/geography, climate, hydrographic domain, and native vegetation cover. Given their particular environmental characteristics, the regions

located both in the large interior watershed of the great "Upper Uruguay River Basin" (sector 3 - West) and in the Atlantic slope of the "Itajaí - Açu River Basin" (sector 6 - Valley), present high potentiality/ relevance for future additions to the inventory of new continental specific registries.

Figure 1.- The six geo-malacological regions of Santa Catarina State/ SC, Southern Brazil. For a summary and additional regional information, see Agudo-Padrón (2014, 2016a)

2. Total number of species registered/ inventoried:

1,020 forms (785 marine and 235 non-marine/ continental), assessed with regard to taxonomy, biogeography, ecology and their "particularly nebulous" conservation status related to agricultural production (as crop pests) and the public health (medical and veterinary), as well as their regional potential as a human food sources or of aesthetic commercial interest (whether they are extractive, fishing and/ or malacoculture), divided in turn into:

2.1. Non-native introduced species, exotic and invasive:

29 forms: four marine (Bivalvia) and 25 non-marine/ continental (21 Gastropoda - one amphibious, four freshwater, and 16 terrestrial) and four limnic Bivalvia. Latest addition: freshwater Asian basket clam Cyrenidae *Corbicula fluminalis* (Müller, 1774).

2.2. Native marine species:

781 forms, contemplated in Agudo-Padrón (2015c, 2017c), being 12 Polyplacophora, 473 Gastropoda, 15 Scaphopoda, 257 Bivalvia and 24 Cephalopoda.

2.3. Native non-marine/ continental species:

210 forms, contemplated in Agudo-Padrón (2008, 2014, 2015a, 2016 b-c, 2017a) and Agudo-Padrón et al. (2014), being 180 Gastropoda (one amphibious, 36 freshwater, 143 terrestrial) and 30 limnic Bivalvia. Of this, 24 of the related Gastropoda -- three limnic/ freshwater and 21 terrestrial -- correspond to "endemic species" of the State. Latest addition: sandbanks snail Bulimulidae *Bulimulus stilbe* Pilsbry, 1901.

Recent new limnic/ freshwater geographical records:

1. Native apple snail Ampullariidae *Pomacea sordida* (Swainson, 1823) (Figure 2).

Specific locality: Campeche (sandbank track at the end of the Rua da Capela (Chapel Street), which runs alongside the local Cemetery), East-south coast of Santa Catarina Island, Florianópolis, Santa Catarina/ SC, Central Southern Brazil region

Date: May 07, 2017

Observation.: Fresh shells found on local sandbank plain, in semi-stagnant waters (bathed) area, showing signs of predation by swampy birds. For a specific environmental and general description, see Agudo-Padrón (2015b, 2016c)

Figure 2.- Native apple snails *Pomacea sordida* (Swainson, 1823) from Campeche, Santa Catarina Island, Florianópolis.

2. Native mussel/ naiad Hyriidae *Diplodon expansus* (Küster, 1856) (Figure 3):
Specific locality: Ariranha River (tributary of the Upper Uruguay River Basin) in the Municipality of Arvoredo, Western region of Santa Catarina State/ SC, Central Southern Brazil
Date: June 22, 2017
Observation: Confirmed species record, with numerous fresh shells found on the bed of the river, after recent period of high rainfall, in the operational region of the Hydroelectric Power Generation (Central Geradora Hidrelétrica - CGH) Ariranha, located on the border between the Municipal Districts of Arvoredo and Seara. For additional regional information, see Agudo-Padrón (2017b).

Figure 3.- Native freshwater mussel/ naiad Hyriidae *Diplodon expansus* (Küster, 1856) from Ariranha River, Arvoredo Municipal District (Map – red color), Western Santa Catarina/ SC. Photographs by Emanueli Marin Albino

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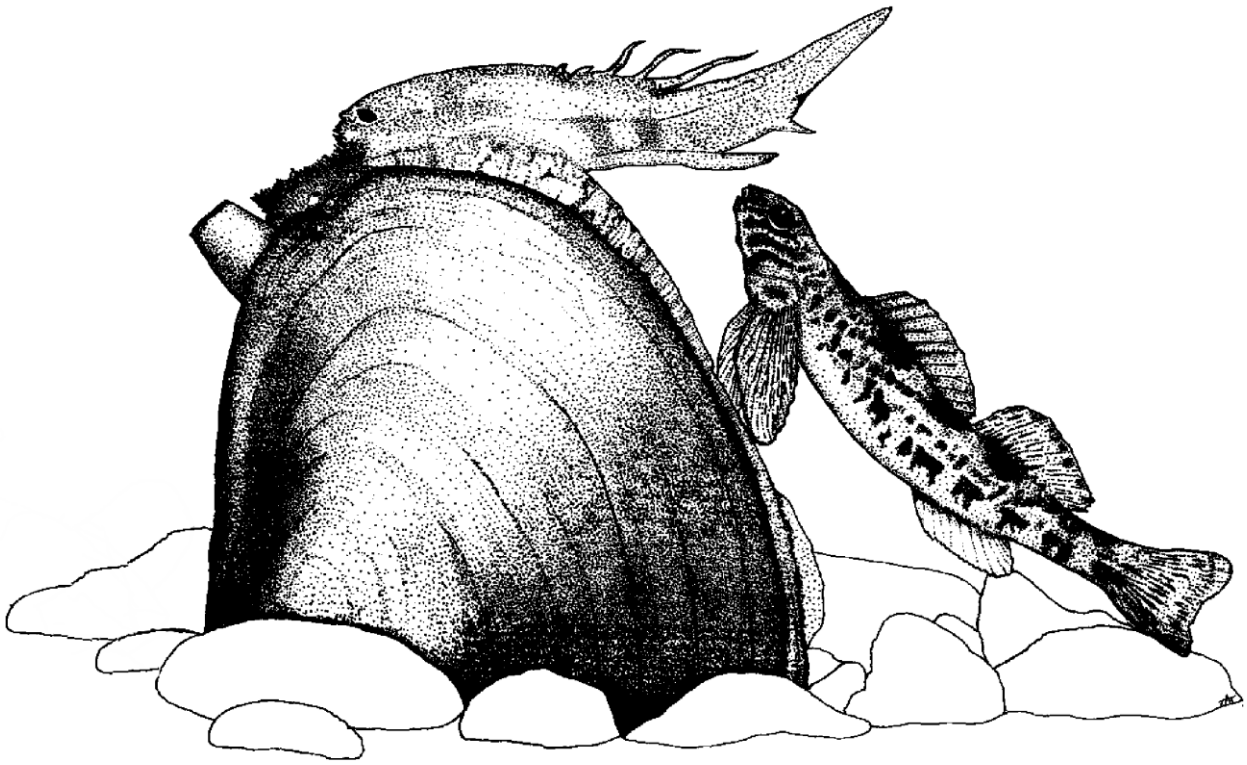

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Ellipsaria is posted on the FMCS web site quarterly: around the first of March, June, September, and December. This newsletter routinely includes Society news, abstracts, meeting notices, pertinent announcements, informal articles about ongoing research, 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 jjjenkinson@hotmail.com. Those 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 to 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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Parting Shot

Members of the August 2017 Conservation Biology of Freshwater Mussel Class at the US Fish and Wildlife Service (USFWS) National Conservation Training Center (NCTC) gained hands-on experience with semi-quantitative, quantitative, qualitative, and mark/recapture mussel sampling techniques in the Cacapon River in West Virginia. The students in this class came from 16 different states and represented the USFWS, US Army Corps of Engineers, US Geological Survey, US National Park Service, and the US Federal Energy Regulatory Commission. This course is one week long and focuses on biology and sampling techniques. Instructors for this session included Heidi Dunn, Chris Barnhart, Megan Bradley, Janet Clayton, and Bob Anderson. Matt Patterson is the NCTC course director. Photograph by Janet Clayton, West Virginia Division 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.