Newsletter of the Freshwater Mollusk Conservation Society
Vol. 27 – No. 1 ISSN 2689-2936 Spring 2025

COVER STORY

Photo credit Mark Hove

President's Message, 2025

I am grateful to have been chosen to join the executive committee for the Freshwater Mollusk Conservation Society (FMCS) as president. Serving as the president-elect over the past two years has been a great opportunity for personal growth. Thank you to the local committees who worked diligently to plan the Auburn ecophysiology workshop, the Karlstad European meeting, and our recent Ann Arbor- Ypsilanti meeting! This May, our 14th Biannual Symposium had 285 attendees (either virtually or in- person) representing 15 countries. We hope you all had a good time, whether your way of learning and making professional connections is playing board games in the hospitality suite, soaking up new information at poster sessions, or seeing local fauna in the Raisin River together. Please look for an extended overview of the symposium in our fall issue of Ellipsaria.

What is next for FMCS?

Meeting as a society has been an important way to further our society's mission of "conservation and advocacy for freshwater

mollusks" and to bring people together to foster connections with one another for 26 years! With a generation of mollusk conservation behind us, Rachel Muir is working to lead an oral storytelling project covering the history of our society. If you have a story to tell of your own or are willing to help pry the interesting details out of others, please reach out.

While we reflect on efforts made by the greater mollusk research and conservation community over the past few decades, the National Strategy Committee will also begin to look ahead to revise our society's National Strategy. Due every fifteen years, the last document was published in 2016. It is time to assess our conservation priorities as progress has been made on some fronts, and we find emerging issues on others.

The Professional Development Committee has welcomed their first class of Mollusk Professional Certification graduates! The committee had a vision and built the program with great care. The certification program is currently accepting applications from the wider membership. Whether you have been working with mussels for just a few years or for thirty, show them your great appreciation of their time and hard work and put a seal on it!!

The Environmental Quality and Affairs Committee and the Consortium of Aquatic Science Societies have signed several letters of support on behalf of the society in response to rapid changes in funding availability and policy. We will continue to look for these opportunities, in support of one other and in support of our very special molluscan friends. When someone has a personal struggle, medical or otherwise, my niece coined these as an individual's "hard things" when she was five. As a group of people working with an underfunded group of taxa, our jobs can be made difficult with things like limited staffing and funding, without additional pressures that many of you may be experiencing now. Emotions are high as we all navigate these "hard things", so please look out for your colleagues to lend a hand (or an ear) or look *to* them when you need a lift. I started a gratitude jar at home in January. It is cheesy, I know, but this source of reflection has made me feel a little better. What have you done to get through your "hard things"?

I look forward to working with you all over the next few years. Thank you again for this opportunity.

Sincerely,

Amy Maynard

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Contributed Articles

The following articles were contributed by FMCS members and others interested in freshwater mollusks. Contributions like this are incorporated into Ellipsaria *without peer review and with little editing. The opinions expressed are those of the authors.*

A Provisional List of the Mexican Sphaeriidae: Common and Scientific Names, and distribution.

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During the FMCS Bivalves Common and Scientific Names Subcommittee meeting held 10 April 2023 in Portland, Oregon, we discussed expanding the FMCS list of freshwater bivalves to include the Sphaeriidae. These are Fingernail, Pill or Pea clams and have a global distribution excluding Antarctica. This family was included in Turgeon et al. (1988, 1998) volumes of common and scientific names but was not included in Williams et al. (2017) or the FMCS (2019, 2021, 2023) lists of freshwater bivalves of North America. We also discussed at the FMCS meeting adding the freshwater mollusks of Mexico to the common and scientific names list.

Sphaeriidae is the second largest freshwater bivalve family currently containing 260 recognized modern species in two subfamilies and eight genera (MolluscaBase, 2024). Bogan (2008) reported 196 species, while Graf (2013), Lee (2019), and Graf and Cummings (2021) estimated current worldwide Sphaeriidae diversity at 227 species. The most recent Sphaeriinae phylogeny was by Bespalaya et al. (2023).

Publications on the Sphaeriidae of North America (Burch (1973, 1975) only included taxa found in Canada and the United States and made no mention of the Mexican sphaeriid fauna. Herrington (1962) mentioned *Euglesa obtusalis*

from Mexico. and Mackie (2007) mentioned Mexican records for *Conventus insigne, Euglesa casertana, Euglesa compressa, Sphaerium transversum*.

The literature on Sphaeriidae of Mexico is limited. Two recent papers provide the most recent lists of this fauna (Conteras-Arquieta, 2000; Czaja et al., 2023). Older literature mentioned and described new species and provided some locality information.

Pisidium atlanticum Sterki, 1905 was described from Veracruz and recognized as valid by Pilsbry (1926). MolluscaBase (2024) and Musselp (2024) list *P. atlanticum* as a junior synonym of *Euglesa casertana* (Poli, 1791).

Sphaerium (Eupera) yucatanense (Crosse and Fischer in Fischer and Crosse (1894 2: 653, pl 63 -1-1a; pl. 64, figs. 1, 1a, b) was published as a replacement name for *Cyclas maculata* Morelet, 1851 not Anton, 1837). Musselp (2024) listed the name as a synonym of *Eupera singleyi.* MolluscaBase (2024) has listed *S. yucatanense* as a *taxon inquirendum*. Bequaert and Clench (1933) treated this species as valid from the Yucatan.

Peláez Parra (2020) noted in her unpublishes honors thesis on the archaeological freshwater mollusks of Tlatelolco, Mexico City, that four species were recorded from the Basin of Mexico: *Pisidium casertanum*, *Pisidium milium*, *Sphaerium transversum* and *Sphaerium striatinum* (Lozada Flores, 2010). She identified specimens of two species *Pisidium casertanum* [=*Euglesa casertana*] and *Sphaerium striatinum* from the archaeological deposits examined. Peláez Parra (2020) also recorded *Sphaerium* (*Musculium*) *lacustre* from Tlatelolco, Mexico City.

Pisidium obtusale Pfeiffer, 1821 was mis-identified and the earliest name available is *Euglesa obtusalis* (Lamarck, 1818) (MolluscaBase 2024; Musselp 2024). It was listed from Mexico by Herrington (1962) and Contreras Arquieta (2000) but no specific localities or provinces were given.

Herrington (1962) listed *Sphaerium transversum* (Say, 1829), *Pisidium casertanum* (Poli, 1791), *Pisidium compressum* Prime, 1851, *Pisidium nitidum* Jenyns, 1832, *Pisidium obtusale* Pfeiffer, 1821, *Pisidium punctiferum* (Guppy, 1867) from Mexico without specific locality given.

Table 1. Presents an update of the taxonomy of the Sphaeriidae listed by Contreras-Arquieta (2000) and Czaja et al. (2023) compared with the taxonomy presented by MolluscaBase (2024) and MUSSEPp (2024). These results are the basis for Table 2 to list any known common names and the reported distribution in Mexico.

Table 1. List of Sphaeriidae reported by Contreras Arquieta (2000) and Czaja et al. (2023) compared with, the taxonomy used in Musselp (2024) and MolluscaBase (2024).

Contreras-Arquieta (2000)	Czaja et al. (2023)	Mussel p	MolluscaBase	Revised list
Pisidium casertanum (Poli, 1791)	*Euglesa casertana* (Poli, 1791)	*Euglesa casertana* (Poli, 1791)	*Euglesa casertana* (Poli, 1791)	*Euglesa casertana* (Poli, 1791)
Pisidium compressum Prime, 1852	*Euglesa compressa* (Prime, 1852)	*Euglesa compressa* (Prime, 1852)	*Euglesa compressa* (Prime, 1852)	*Euglesa compressa* (Prime, 1852)
	Eupera cubensis (Prime, 1865)	*Eupera cubensis (Prime, 1865)*	*Eupera cubensis* (Prime, 1865)	*Eupera cubensis* (Prime, 1865)
Eupera insignis Pilsbry, 1926	*Eupera insignis* Pilsbry, 1926	*Eupera insignis* Pilsbry, 1926	*Eupera insignis* Pilsbry, 1926	*Eupera insignis* Pilsbry, 1926
	Eupera singleyi (Pilsbry, 1889)	*Eupera singleyi* (Pilsbry, 1889)	*Eupera singleyi* (Pilsbry, 1889)	*Eupera singleyi* (Pilsbry, 1889)
		Conventus insigne (Gabb, 1868)	*Conventus insigne* (Gabb, 1868)	*Conventus insigne* (Gabb, 1868)
	Musculium partumeium (Say, 1822)	*Sphaerium partumeium* (Say, 1822)	*Sphaerium partumeium* (Say, 1822)	*Sphaerium partumeium* (Say, 1822)
Sphaerium subtransversum Prime, 1860	*Musculium subtransversum* (Prime, 1860)	*Sphaerium subtransversum* Prime, 1860	*Sphaerium subtransversum* Prime, 1860	*Sphaerium subtransversum* Prime, 1860

Musculium transversum (Say, 1829)	*Musculium transversum* (Say, 1829)	*Sphaerium transversum* (Say, 1829)	*Sphaerium transversum* (Say, 1829)	*Sphaerium transversum* (Say, 1829)
Pisidium abditum Haldeman, 1841		*Euglesa casertana* (Poli, 1791)	*Euglesa casertana* (Poli, 1791)	*Euglesa casertana* (Poli, 1791)
Pisidium nitidum (Jenyns, 1832)	*Pisidium nitidum* (Jenyns, 1832)	*Euglesa nitida* (Jenyns, 1832)	*Euglesa nitida* (Jenyns, 1832)	*Euglesa nitida* (Jenyns, 1832)
Pisidium obtusale Pfeiffer, 1821		*Euglesa obtusalis* (Lamarck, 1818)	*Euglesa obtusalis (*Lamarck, 1818)	*Euglesa obtusalis* (Lamarck, 1818)
Pisidium punctiferum (Guppy, 1867)	*Pisidium punctiferum* (Guppy, 1867)	*Pisidium punctiferum* (Guppy, 1867)	*Pisidium punctiferum* (Guppy, 1867)	*Pisidium punctiferum* (Guppy, 1867)
Pisidium vegae Pilsbry, 1926		*Pisidium vegae* Pilsbry, 1926	Not listed	*Pisidium vegae* Pilsbry, 1926
Sphaerium jalapensis Pilsbry, 1904		*Sphaerium jalapensis* Pilsbry, 1904	*Sphaerium striatinum* (Lamarck, 1818)	*Sphaerium striatinum* (Lamarck, 1818)
Sphaerium luridum Martens, 1900		*Sphaerium luridum* Martens, 1900	*Sphaerium striatinum* (Lamarck 1818)	*Sphaerium striatinum* (Lamarck, 1818)
Sphaerium martensi Pilsbry, 1899	*Sphaerium martensi* Pilsbry, 1899	*Sphaerium martensi* Pilsbry, 1899	*Sphaerium martensi* Pilsbry, 1899	*Sphaerium martensi* Pilsbry, 1899

Sphaerium mexicanum Dall, 1905	*Sphaerium mexicanum* Dall, 1905	*Sphaerium mexicanum* Dall, 1905	*Sphaerium mexicanum* Dall, 1905	*Sphaerium mexicanum* Dall, 1905
Sphaerium novoleonis Pilsbry, 1904		*Sphaerium novoleonis* Pilsbry, 1904	Not listed	*Sphaerium novoleonis* Pilsbry, 1904
Sphaerium queretaronis Pilsbry, 1926		*Sphaerium queretaronis* Pilsbry, 1926	Not listed	*Sphaerium queretaronis* Pilsbry, 1926
Sphaerium striatinum (Lamarck, 1818)	*Sphaerium striatinum* (Lamarck, 1818)	*Sphaerium striatinum* (Lamarck, 1818)	*Sphaerium striatinum* (Lamarck, 1818)	*Sphaerium striatinum* (Lamarck, 1818)
	Sphaerium triangulare (Say, 1829)	*Sphaerium triangulare* (Say, 1829)	*Sphaerium triangulare* (Say, 1829)	*Sphaerium triangulare* (Say, 1829)

Table 2. Updated list of Sphaeriidae reported from Mexico with their scientific and common names, and distribution. English common names are from Turgeon et al., 1998. Spanish common names are from the literature or were newly constructed (ENG). Distribution is based on Pilsbry (1899, 1904,1926); Sterki (1905); Bequaert and Clench (1933, 1936); Jacobson (1952); Contreras-Arquieta (1995, 2000); Cózatl-Manzano and Naranjo-García, (2007); Oseguera, Alcocer and Escobar (2016); Cuezzo et al. (2020); Peláez Parra (2020); Czaja et al. (2022, 2023).

Revised list for Mexico	Common names [English]	Common names [Spanish]	Mexican distribution
Conventus insigne (Gabb, 1868)	Tiny Peaclam		VER
Euglesa casertana (Poli, 1791)	Ubiquitous Peaclam		EDOMEX, VER
Euglesa compressa (Prime, 1852)	Ridgebeak Peaclam	Almeja Comprimida	COAH, NL, SLP
Euglesa nitida (Jenyns, 1832)	Shiny Peaclam		COAH
Euglesa obtusalis (Lamarck, 1818)		Almeja obtusa	?
Eupera cubensis (Prime, 1865)	Mottled Fingernailclam		COAH
Eupera insignis Pilsbry, 1926		Almeja distinguida	VER
Eupera singleyi (Pilsbry, 1889)		Almeja de singley	YUC
Pisidium punctiferum (Guppy, 1867)	Striate Peaclam		SIN
Pisidium vegae Pilsbry, 1926		Almeja de vega	QR
Sphaerium martensi Pilsbry, 1899		Almeja de martens	MICH
Sphaerium mexicanum Dall, 1905		Almeja mexicana	SLP
Sphaerium novoleonis Pilsbry, 1904		Almeja de Nuevo León	NL
Sphaerium partumeium (Say,1822)	Swamp Fingernailclam		TAB

Sphaerium queretaronis Pilsbry, 1926		Almeja de Querétaro	QRO, VER
Sphaerium striatinum (Lamarck, 1818)	Striated Fingernailclam		JAL, QRO, VER
Sphaerium subtransversum Prime, 1860		Almeja subtransversa	EDOMEX, MICH, TAB, YUC
Sphaerium transversum (Say, 1829)	Long Fingernailclam		QRO, TLAX
Sphaerium triangulare (Say, 1829)		Almeja triangular	EDOMEX, GTO, JAL, MICH,

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Using Habitat Suitability Modeling as a Tool for Informing Surveys in the Great Plains

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Native freshwater mussels are cryptic and sedentary animals associated with beneficial ecosystem services but are experiencing unprecedented rates of decline due to environmental and anthropogenic factors. With the decline in populations and mussel diversity, identifying suitable habitats in Great Plains states is key to their recovery. Conventional survey methods to detect mussel presence across large scales are not ideal due to labor intensity and sheer vastness of water bodies in South Dakota. Developing habitat suitability models that enable state agencies to identify critical areas with high habitat suitability prior to implementing on-the-ground surveys could increase efficacy of these survey efforts and aid in identifying possible reintroduction locations. Information on mussel distributions is limited in many Great Plains states and so mussel host fish are often used as surrogate indicators of habitat suitability. The objective of our study is to develop habitat suitability models using host fish distribution data for rivers and streams in South Dakota. Models will be based on presence-only information, indicating the survivability and resource requirements for host fish. Model output is expected to identify waterbodies with high, moderate, and low habitat suitability based on the presence of fish hosts and landscape variables (anthropogenic influence, land use intensity, nitrogen, clay, and others). Results of the habitat suitability models will be used to identify and prioritize reintroduction sites for native freshwater mussels (Figure 1), which will hopefully in turn be

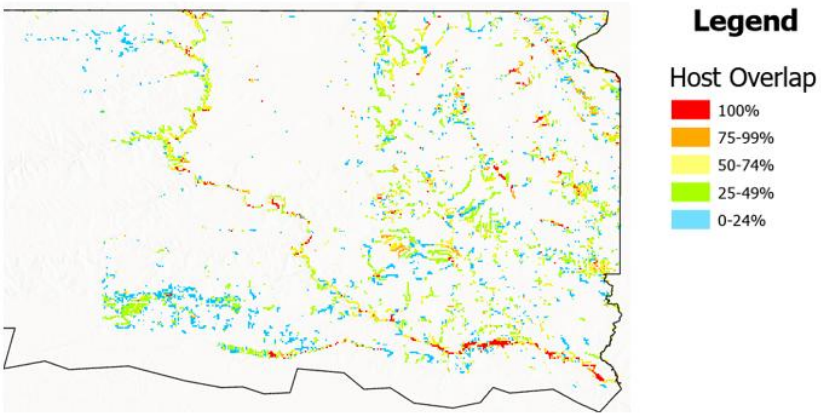


Figure 1. A map of central-eastern South Dakota for the Black Sandshell, representing areas of high, moderate, and low habitat suitability based on the number of fish hosts (8) overlapping.

used to collect adult broodstock for hatchery propagation, and ultimately the reintroduction of juvenile mussels to bolster the endangered and threatened populations.

By Jackson Roe (Jacksoneroe@gmail.com)

The Buttahatchee river in Mississippi is considered to be the location for the only viable, reproducing population of Epioblasma penita. In March of 2025, I undertook an amateur survey to determine the status of the species and the state of the river and its fauna as a whole. I did not touch or disturb living specimens or even dead shells. I simply scanned gravel bars to assess numbers of different mussel species and their relative abundance, or lack thereof.

The most common species on the Buttahatchee river by far is the Alabama orb, this is followed by the Pistolgrip and, surprisingly, the endangered Southern clubshell. There are many riffles between the Bartahatchie bridge and Highway 45. However, outside of this the habitat seems quite unsuitable for riffle species.

Above the Bartahatchie bridge, there is a slow, muddy and meandering section of river where I did not notice a single shell. Almost at the exact point of the bridge, mussel shells began appearing on the bank and in the shallows. This is where I spotted the first Epioblasma specimen, a recently dead female.

Female Epioblasma penita encountered by the author.

I encountered about 20 Epioblasma penita specimens in total, including just two female shells. This puts the gender ratio quite skewed at 1:10 female to male. The largest specimens I spotted on the bank were a few males that may have slightly exceeded two inches. Epioblasma penita can be confused with smaller Pleurobema specimens, but generally they are distinctive to a trained eye.

A section of the Buttahatchee between Bartahatchie bridge and Highway 45 is unstable gravel that seems to shift quite often for approximately one mile. In this section I did not see a single mussel shell on the bank. Likewise, a few miles before Highway 45, the bank has been eroding out. The shifting gravel has apparently smothered all mussels in this section as well.

I have communicated with several mussel experts about the disparity of the genders in Epioblasma penita. One theory suggests the females burrow deeper than the males and so they are less likely to be encountered. However, this seems unlikely to me. Dry sections of gravel bars still displayed more males where females should have also been present. I even encountered one live male with its foot extended apparently inching back into deeper water. I believe that Epioblasma penita is more imperiled than we realize. It is possible that the gender ratio is a natural occurrence, but even if this is the case the river itself is in real danger. The entire lower half of the river seems to be eroding away and becoming unstable. This is apparently snaking upstream. Epioblasma penita specimens appear just before the erosion, so these individuals are immediately threatened. The entire Buttahatchee population appears threatened most by erosion.

Erosion of the banks of the Buttahatchee just before Highway 45.

I recommend swift action to contain this erosion. It is unclear how much of the river could be consumed by an unstable substrate that is unsuitable to mussels. In my opinion, barriers of some sort should be built at the head of the erosion in the lower section in an attempt to contain it and stop it from eroding the banks upstream. Epioblasma penita is one of the last "combshell" species in existence and is quite a unique and beautiful species. It would be a shame if it was lost due to this man-caused erosion downstream.

Ponds and Streams by Herbert D. Athearn

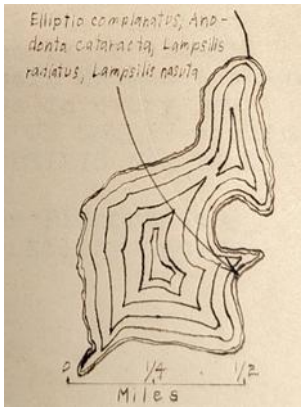
By Arthur E. Bogan, Cynthia M. Bogan and Jamie M. Smith
North Carolina Museum of Natural Sciences, Raleigh, NC 27601

November 2023, the Mollusk Unit at the North Carolina Museum of Natural Sciences (NCSM) received a donation of books, journals and fieldnote books from the Herbert D. Athearn estate donated by his daughter Marjorie and her husband Larry Gates. This donation included a series of several malacological journals, other freshwater mollusk papers and books, and the original handwritten field notes. The field notes include detailed field data including, but not limited to, air mileage, habitat, stream flow, stream width, sediment type, vegetation, other animals observed, and critical information such as pollution. We were excited to receive the original copies of Herb's field notes, even though we had photocopies of most of the volumes. While inventorying this donation, we found a small 6.5 x 9 inch black, three-ring binder. Herb didn't mention this binder during our work on the collection or during the transfer of his mollusk collection to the NCSM.

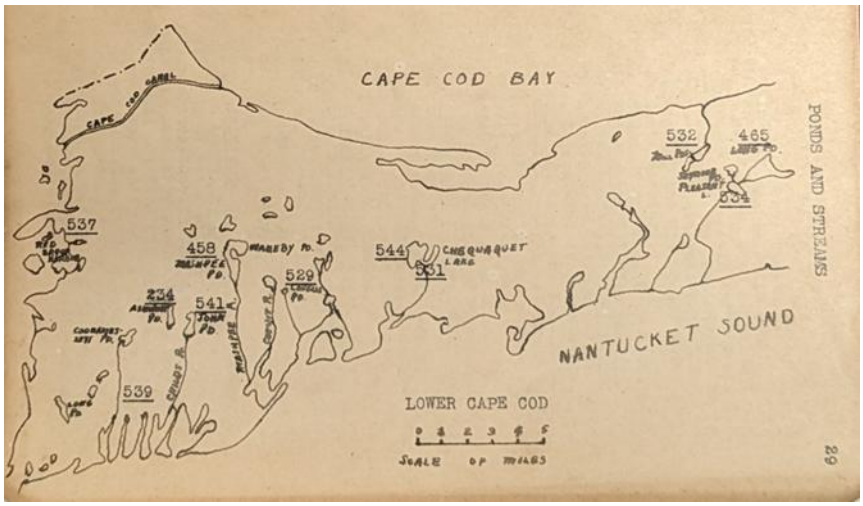
The small black binder contained the typewritten manuscript entitled "Ponds and Streams" on the title page and the following page, the title, abstract, and the notice by H. D. Athearn, Fall River, Winter 1941-42. The abstract is:

> "This handbook is designed to give the reader a description of ponds and streams where Unios are and have been found by the author. It also contains a list of the Unios found and a brief description of them if they are unusual. It includes a map of the freshwater body where the collecting was done."

The first 32 pages were typed on plain paper, but a few pages were on lined paper. Page 32 ends with the date June 1948. The ponds and streams section cover collecting activities at nine ponds, one lake, one reservoir, two rivers and Cape Cod in Massachusetts, Connecticut, Vermont/New York, and Rhode Island. Each water body discussion is accompanied by a map and a discussion of the unionids collected, for example, Cooks Pond, Bristol County, Massachusetts, with the list of the four species collected on page 3. The maps noted some sites with Herb's early field numbers (pages 18, 21, 22, 24, 25, 27, 29). Detailed drainage anatomy, species descriptions, most common mollusks, and the best habitat/areas to collect mollusks are explained.



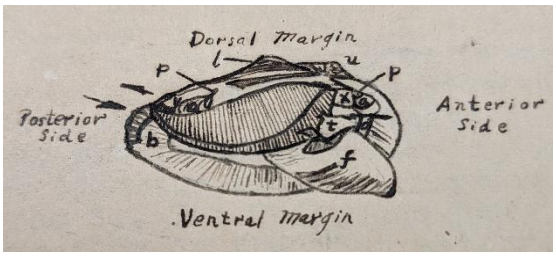
Page 29 is a map of Cape Cod with 11 collecting sites flagged and numbered.



The second section is entitled “Variation in species of Unionidae.” The first section contains five pages of shell descriptions and seven pen and ink drawings of *Elliptio complanata* collected in the area.


Fig. 3. ELLIPTIO COMPLANATUS Dillwyn.

The following section is entitled “Bivalve Shells” with the subtitle ‘Structural and Systematic Conchology’ Tryon. This section was based on the comprehensive work of G.W. Tryon (1882-1884). It includes the description of the life position of these animals, shell landmarks, and standard measurements. Following this is a discussion of the animal with a labeled figure of *Unio pictorum,* including notes on the organs of movement and muscles [after Tryon 1882: plate 3, fig. 52], the nervous system, including an illustration of the nervous system of *Anodonta* [after Tryon 1882: plate 5, fig. 69].



The next topic is the **Organs of Sense,** which include touch, sense, auditory, olfactory, and gustatory organs. The following is a topic on **Respiration**. Herb provided a discussion of the classes of Mollusca and a figure of the cross-section of *Anodonta* with the organs labeled, following Huxley. **Circulation** is the next topic with a figure of the circulatory system of

Mytilus edulis [after Tryon 1882: plate 7 fig. 84]. **Digestive organs** is the final topic and contains a figure caption for a missing figure, "Anatomy of the American Oyster." Variation in species of Unionidae has 11 numbered pages.

The Ponds and Lakes manuscript is followed by a duplicate set of pages:1-20 with maps, but pages 21-28 are typed on lined paper and contain the hand-drawn maps and annotations, pages corresponding to pages 21-28 in the front of the manuscript, which lack maps. Pages 29-32 are not included.

The dates of January 1948 are at the bottom of various accounts (see pages 19, 20, 23, and 26), and there is a note on page 32 with a date for visiting a pond on 3/14/1948. The last account on page 32 was dated June 1948. The final manuscript with figures and maps was completed in the second half of 1948. At unknown later date(s), annotations were made to use the genus *Ligumia* and *Leptodea,* the viviparid genus *Cipangopaludina*, and to change *Strophitus edentulous* to *S. undulatus*. He also changed the authorship of *Elliptio complanata* from Dillwyn to Lightfoot.

This typed manuscript represents Herb's early attempt to fill a gap in his understanding of the distribution, ecology, and biology of freshwater mussels in Massachusetts. At this time, there was a lack of state field guides for freshwater mussels. As far as we can discern, this manuscript was never mentioned, shared, or published.

Literature Cited

Tryon, G.W. 1882-1884, Structural and systematic conchology: an introduction to the study of the Mollusca. Published by the author. Philadelphia. Three volumes

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Genomic-quality DNA Can be Obtained from Mussel Foot Swabs

Nathan V. Whelan[1,2]

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Since 2018, my collaborators and I have been using non-lethal foot swabs to obtain DNA that is suitable for genomic techniques. My collaborators and I have also published several population genomic studies that used DNA that was obtained from non-lethal foot swabs (Garrison et al. 2021, Gladstone et al. 2022, Adcock et al. 2024), and we have many more genomic studies that used non-lethal foot swabs are in progress. However, I have heard numerous anecdotal stories from colleagues about foot swabs failing to produce adequate data for genomic data generation techniques like RAD-seq. I have also received multiple questions about whether swabbing the foot of mussels results in high enough quality DNA for genomic approaches. Although the use of foot swabs for genome-quality DNA has been published in multiple-peer-reviewed journal articles, I think the freshwater mollusk conservation

community would benefit from a step-by-step swabbing protocol and clarification about what materials and methods work best.

The following swabbing protocol has been used by members of my research group and many of our collaborators/partners. The specific materials used in the protocol have demonstrated success for generating high-quality DNA that is suitable for genomics research. Other materials and methods may also work for foot swabs, but in every case that I am aware of where swabs "did not work", other materials and methods were used.

At this time, I cannot comment on whether swabbing will work for RNA, but consumables designed for RNA preservation from buccal swabs exist. I also do not know whether swabbing will result in long enough DNA strands for robust, long-read sequencing (e.g. PacBio or Oxford Nanopore). However, DNA fragment lengths of DNA extracted using the following protocols are almost always above 10 kilobases.

Although foot swabs are not the only way to non-lethally sample, they appear to be the least invasive and require the least amount of training. Clips of the mantle can result in mantle tissue pulling away from the shell. Foot clips, or biopsies, create a wound. Hemolymph draws require extreme care and can result in puncturing vital organs (e.g., a misplaced needle in the foot, puncturing the stomach).

Ultimately, individual researchers and permitting agencies need to determine the approach that is best for the focal species. That said, foot swabs, if done with the right material and methods, are a viable, non-lethal method for obtaining DNA that is suitable for many genomic approaches.

Materials and Methods

The consumables used below are more expensive than placing swabs in ethanol and some other extraction methods. However, materials and methods presented here work exceptionally well for genomic approaches. Without a doubt, it is cheaper to use proven consumables than have a complete failure of downstream applications.

The following consumables and extraction kits appear to be essential for obtaining high-quality DNA from foot swabs. Justification for each consumable is provided

Swabs: 250 x 1 Swab Individually Wrapped & Ethylene Oxide Treated (IsoHelix SK-3S). These are flat buccal swabs. I recommend against the swabs that have tubes already because the ones that are manufactured by IsoHelix are difficult to open; they are nearly impossible to open without spilling the stabilization medium, which is a potential source of contamination. Dental brushes or anything that looks like a pipe cleaner should be avoided as they can easily destroy gills and other internal organs.

Storage Medium: IsoHelix BuccalFix (sold in pre-filled tubes [BFX/S1-05-50] or bulk that can be put in tube of choice [BFX-25]). Using a stabilization buffer, rather than ethanol, is critically important for ensuring high DNA yields. The problem with ethanol is that cells that fall off the swab and into the ethanol will not be included in the DNA extraction. In contrast, the stabilization buffer is used as the digestion buffer when doing the DNA extraction. Swabs stored in IsoHelix BuccalFix should be stored at room temperature. Storage in cold conditions

could result in salts precipitating out of solution and result in DNA degradation. DNA and swabs stored in BuccalFix solution are stable for at least three years at room temperature.

Extraction Kit: IsoHelix XTREME DNA Isolation Kit (XME-50). This kit results in very high DNA yields of high purity. Other IsoHelix kits do not result in as high quality of DNA, possibly because of the DNA extraction not removing downstream inhibitors.

Swab Protocol

The following swab protocol has been used by many different field crews and on many different mussel species. The method is straightforward, but the below protocol has much more detail than what is in a standard, peer-reviewed publication.

If possible, wear nitrile or latex gloves when swabbing.

Please take special care to make sure swabs only come in contact with one mussel. This is the most important part of the protocol. If a swab comes in contact with more than one mussel, it would be better to discard the swab and potentially loose one or more samples than retain a swab that touched two mussels**.**

If tubes are not already labelled, please label tubes before swabbing. It would be best to use a pencil or sharpie on the paper(ish) label wrapped around tube because pencil will not smear; if tube does not have paper wrapping then a sharpie is best. Please take standard field notes (e.g., species, collection site, collector, date) for each tube/sample.

1) Once an animal is ready to be swabbed, unscrew one **labelled** vial with buffer in it. Vials should be labelled based on the species you are collecting (e.g., Spec # for Spectaclecase). Vial caps are no longer being manufactured attached to the vial, so please take care when handling the cap (e.g., placing the cap down with the top touching the surface you set it on, especially to avoid contamination).

2) Open packet with swab. Take care not to touch any part of swab below notch where it will be snapped into a tube. If you do touch that part, it is better to discard the swab than continue using it, especially if you are not wearing gloves.

3) Rub swab flat on mussel's foot, pull swab out and then flip swab over and rub other side. Please make sure both sides of the swab have been thoroughly rubbed on the mussel’s foot. When possible, avoid picking up obvious non-mussel material (e.g., mud). Please take care not to touch swab on outside of mussel.

4) Place swab in buffer filled tube, snap off top of swab by leaning notch against tube. Take care not to spill buffer.

5) Twist the cap on tube and briefly shake tube to ensure buffer has touched all parts of swab tip.

6) The DNA is now stable at room temperature. However, if you will be in the field where temperatures can exceed room temperature, placing the vial box in a cooler with ice is ideal. Please try to make sure that the box does not simply float in melted ice as to avoid water sloshing around with tubes. Use Ziploc bag(s) for tube box(es).

7) Take a picture of each specimen you swab.

Disclaimer: The findings and conclusions in this article are those of the author and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

References

Adcock, M. C., K. R. Moles, N. L. Garrison, S. A. Donohoo, and N. V. Whelan. 2024. Population genomics of the endangered freshwater mussel, *Arcidens wheeleri* (Unionoidea: Unionidae: Anodontini), in the Little River, Arkansas, USA. Journal of Molluscan Studies **In Press**.

Garrison, N. L., P. D. Johnson, and N. V. Whelan. 2021. Conservation genomics reveals low genetic diversity and multiple parentage in the threatened freshwater mussel, *Margaritifera hembeli*. Conservation Genetics **22**:217-231.

Gladstone, N. S., N. L. Garrison, T. Lane, P. D. Johnson, J. Garner, and N. V. Whelan. 2022. Population genomics reveal low differentiation and complex demographic histories in a highly fragmented and endangered freshwater mussel. Aquatic Conservation: Marine and Freshwater Ecosystems **32**:1235–1248.

FMCS Officers

Ellipsaria is posted on the FMCS web twice a year: with a Spring issue in May, and a Fall issue in October of each year. The newsletter routinely includes Society news, meeting notices, pertinent announcements, and informal articles about ongoing research concerning freshwater mollusks and their habitats. Anyone may submit material for inclusion in *Ellipsaria* and all issues are accessible to anyone on the FMCS website (http://molluskconservation.org).

Articles contributed to *Ellipsaria* should be preliminary or initial observations of note (e.g., natural history observations, meaningful new distribution records, interesting finds, etc.) concerning freshwater mollusks, their habitats, and/or their conservation. Articles that include quantitative analyses, draw conclusions based on analyses, or propose taxonomic revisions should not be submitted to *Ellipsaria* and, instead, should be submitted to a peer-reviewed journal such as *FMBC*. Please limit the length of contributed articles to about one page of text (i.e., excluding pertinent tables, figures, and references).

Information for possible inclusion in *Ellipsaria* should be submitted via e-mail to the editors, Bob Anderson and Don Hubbs, at Ellipsaria@gmail.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, but the editor may be able to convert other formats. Graphics should be in a form that can be manipulated using Photoshop. Note that submissions are not peer-reviewed but are edited for clarity and checked for appropriateness for posting in this freshwater mollusk newsletter. Feel free to contact the editor with questions about possible submissions or transmission concerns.

FMCS Committees and Their Chairs/Co-chairs

FMCS ExCom & Committee Reports -- Spring 2025

Treasurer's Report

The Finance Committee and the Executive Committee approved an updated 2024 FMCS Balance Sheet, which accounted for the late-arriving interest disclosure on our three CDs invested with Bank of America. This adjustment resulted in a revised balance sheet showing total liabilities and equity of $89,215.90. Moreover, the committees also approved a draft of the 2024 FMCS 990EZ IRS submission form, which was subsequently submitted to the IRS on May 1, 2025, and accepted on May 2, 2025.

Concerning the finances associated with the 2025 Symposium, as of May 1, 2025, an income of $149,473.82 and expenses totaling $156,601.21 were reported, resulting in a loss of $7,127.39. As of May 1, we had net sponsorships amounting to $23,524, with an additional $500 sponsorship anticipated post-May 1. While some expenses are still pending, we expect an increase in income from late registrations. As of noon Eastern Time on Friday, May 9, 2025, we recorded a total of 280 registrants: 160 member registrations (4 unpaid), 87 non-member registrations (3 unpaid), and 33 virtual registrations (1 unpaid).

Secretary's Report

- As of May 10, 2025, all memberships within Wild Apricot were updated with current symposium registrations. This may still need to be done for late registrations and potentially virtual registrations.
- The Wild Apricot contacts list was exported on May 10, 2025, and all duplicate memberships were merged.
- Sarah Veselka has given Teresa Newton all hard materials retained by the Secretary to be transported to Traci DuBose. This includes one small box with three large binders and two small binders of mostly Society meeting minutes.
- We currently have 438 active members and 638 renewal overdue members. This number is low when compared to previous years. I suggest conducting membership drives between symposium years emphasizing what membership dues pay for.
- Please contact Sarah Veselka or Traci DuBose if you are having trouble accessing your membership profile (email, password, etc). Do not create new duplicate profiles.

Symposium Committee

- The 2025 Symposium is complete. Detailed registration, income, and sponsorship numbers can be found within the treasurer's report.
- The 2026 Propagation and Conservation themed workshop proposes to take place the week of October 19th at the Maritime Institute Conference Center in Baltimore, MD. The workshop planning group has welcomed several new members to its team, has a list of invited speakers/field trips prepared, and budget discussions are underway.

- Our next symposium will be held jointly between the Freshwater Mollusk Conservation Society and the American Malacological Society around mid-April 2027. The planning team is currently visiting and reviewing venues in the mid-Atlantic region.

CASS Update

- Society for Freshwater Science led the way in assembling a letter addressed to the EPA to offer comments on proposed changes to the implementation of the definition of the "waters of the United States". FMCS was one of 10 CASS member societies to sign onto this letter. This letter and others have been added to the FMCS website under the Environmental Quality and Affairs Committee webpage and shared with membership via email and/or social media.
- JASM Implementation Plan/MOU isn't due until December of 2026, but voices in CASS believe that a push needs to be made to complete this plan by December of 2025. The JASM planning team is working to select two individuals to lead this team.
- The CASS EVOLVED NSF funding has been pulled. The principal investigators of this grant are working to file appeals.

Outreach Committee

- Great turn out for this year's symposium student mixer. 50 students, 75 mentors that we had to cut to 25 for room capacity.
- After this symposium, the FMCS twitter is being deleted, and we will not be using Bluesky as well as Instagram and Facebook.
- There is an open seat for the committee chair.

National Strategy Committee

- The FMCS National Strategy document was previously published in 1995 and 2016. The National Strategy Committee is tasked with updating this document every 15 years. Twenty people were in attendance for the National Strategy committee meeting at the 2025 FMCS spring symposium on 5/14/25.
- The current national strategy is divided into 10 goals / objectives / issues:

1. Increase knowledge of distribution and taxonomy
2. Stressors
3. Quantity and quality of suitable habitat
4. Ecology
5. Restoration
6. Ecosystem services
7. Longterm funding
8. Conservation national strategy
9. Education and outreach
10. Advocacy

- Group discussed the importance of including snails and sphaeriids, and ensuring the committee and document have a wide range of geographic representation.
- Sarah Douglass and Kate Holcomb were elected as Co-Chairs of the committee and Becca Winterringer was elected as Secretary.
- Action items: group will review the last two documents and meet virtually in early November to edit or add to the 10 broad overarching topics that structure the document. Becca will introduce the Conservation by Design process to Sarah and Kate.

Future decisions / discussions:

- Recruitment of volunteers to spearhead each topic including a mini literature review
- Topic sub committees for 1) geographic areas, 2) lakes, rivers and streams, 3) mussels, snails, and sphaeriids
- Addition of field techniques compilation or others for additional topics
- Reference to USGS and European documents / strategies

DEI Committee

Committee: Sara Craft (KY DOW; chair) + recent active members: Jer Pin Chong (University of Illinois - Chicago), Mark Hove (U of MN), Kentaro Inoue (Shedd Aquarium), John Pfeiffer (Smithsonian), Xenia Rangaswami (Aquarium of the Bay), Chantelle Rondel (NC Wildlife), Claire Waterhouse (Shedd Aquarium), Daelyn Woolnough (Central Michigan University) + many others on our mailing list

- The last committee meeting via Teams was April 4th, 2025. The next meeting will be in June 2025. We meet approximately monthly via Teams. All are welcome.

Committee Tasks (2025):

- Keep DEI issues on the forefront.
    - Continue discussions on better common mollusk names (point of contact – Daelyn Woolnough)
        - Names petition was submitted in April, signed by Daelyn, Dave Zanatta, Sara
        - Will be voted on by the Names committee at the symposium
    - Create DEI committee Discord server to facilitate safe environment for DEI discussions, sharing of resources etc - *complete*
        - Created in April, the symposium will be advertised at symposium as a new place to locate resources and connect with committee
    - Participate in open letter to congress speaking out against treatment of federal employees and backlash against science and DEI in general (point of contact- Mark Hove) – *completed*
        - DEI comm supported and urged FMCS to participate in this letter, which we did

- Summarize FMCS semi-annual demographic survey results (point of contact - Sara Craft)
  - The survey results are summarized and will be presented at symposium
  - Not going to publish full results in Ellipsaria this year but will create a summary document available through committee Discord, in Google drive, or upon request
    - No major demographic differences from 2022 results but some changes in opinions and experiences

- Foster a welcoming environment for FMCS members (and other interested people).
  - Create student travel awards to the 2025 FMCS Symposium (points of contact - Mark Hove and Chantelle Rondel) -*complete*
    - The two recipients were chosen Julie Morin and Bijit Khadka, and funds will be dispersed as reimbursements after symposium attendance
    - students will be paired with mentors at symposium and submit exit interview of experience to ex comm
  - Participate in 2025 symposium local planning committee meetings (point of contact - Daelyn Woolnough) – *complete*
    - Daelyn worked hard in planning to ensure gender neutral bathrooms, pronoun stickers for nametags, widely broadcast awareness of Code of Conduct, and a speaker who will touch on diverse topics
  - Update Code of Conduct and establish system for reporting and mediating instances of misconduct (point of contact Sara, Xenia, Claire) -*in progress*
    - Code of conduct revisions have been more or less finished for some time, and will be reflected at symposium
    - Form for reporting misconduct still in process, Xenia created a draft and shared at April meeting, currently being edited and workshopped by whole committee with goal of completing before 2026 work shop- need ex comm support/input

- Revisit our draft strategic plan and update our committee goals and actions
  - Revise committee's strategic plan (point of contact Sara) – c*ompleted*
  - A review was completed by Tam ad Traci in 2024 before they both needed to step away from the committee- activity currently not quite finished- priority to complete before end of year
  - Create a list of active and completed DEI committee projects (ongoing) that links back to the strategic plan goals, with points of contact, to encourage more understanding, participation, and accountability.

Other general updates:

- Tam stepped down abruptly as chair, Sara appointed as replacement (but without much context… so probably needs lots of reminders about meetings and reports)
- **DEI comm would like list of members to be removed from website to protect privacy of participants, who may be restricted by their agencies (list only chair)**
- Discussion about changing the name of the committee- we decided to keep the name, but be more cautious about sharing names of participants attached to forward-facing projects
- Changing meeting format so that some meetings will be focused on projects and others will be opportunities to facilitate discussions of general DEI topics and build community

Please see previous committee reports for additional items that this committee is working on.

Finance Committee

- The Finance committee has reviewed 2024 P&L, balance sheet, and 990. Alan, as usual, has done an excellent job preparing these statements and tax forms, and they were all approved. We also worked with Alan on the 2025 budget. The only outstanding item was whether to fund the web site update this year. During the board meeting, Alan indicated that the symposium would break even, therefore funds are available for the web site revision. No new funding requests came before the board.

- The committee met at the symposium. We have a few new members- Kyle Sullivan, Brian Watson, and Emory Hagemeyer. Brian Watson has agreed to be the Chair and Heidi Dunn will be co-chair. Other members of the committee include Sara Craft, Teresa Newton, and Nathan Johnson in addition to the executive committee (Megan Bradley, Amy Maynard, David Berg, Alan Christian, Traci DuBose).

Conservation & Restoration Committee

- The meeting was organized and moderated by Co-Chair Jesse Weinzinger. Committee Chair Nathan Eckert participated via phone. A total of 42 individuals were in attendance according to the sign-in sheet.

Environmental Quality and Advocacy

- The EQA Committee and president-elect met with several committee members in March to discuss opportunities to provide public comments to proposed federal regulations and actions, including to NEPA and WOTUS.
- The ExComm also worked to sign on to society letters including the Union of Concerned Scientists and a joint scientific society letter. We also provided an opportunity for membership to sign on to an open scientist's letter related to proposed changes to the definition of "harm" under the Endangered Species Act. Information related to these activities can be found on our committee page on the website.

Old Business

Production Facility Database

- The purpose of the production facility database is to share information amongst the group and allow researchers and/or clients to see a rough list of species produced to help facilitate the production of animals needed for research purposes. It was decided to list species simply by genera to shorten the lists and hide some of the listed species being raised from public view. Further discussion centered on who sees the list, it was stated that after the upcoming website upgrades that this list will only be seen by FMCS members so there should be no concern about our contact info being spread around or distributed to third parties. The currently posted facility database was passed around for attending members to make edits. Nathan offered to update the list and ensure that it is loaded onto the new website. Brian Watson suggested that one contact person be used per State to update the list of species produced at the various facilities.

New Business

'26 FMCS Workshop on Propagation/Restoration

- This workshop will be hosted by Matt Ashton in Maryland. The theme is, "Look how far we've made it: changes in techniques and outcomes over 30 years of mollusk propagation and culture for restoration and future directions". He has sent out an email asking potential speakers about their interest in attending and speaking about the last couple decades of mussel restoration work. After some shuffling around of government employees he needs about 3 additional volunteers to help plan and execute the workshop. Jesse volunteered to help during the committee meeting, **all attending were encouraged to reach out to Matt if they could help.**

10-year update to the Mussel Kill Book

The second edition of the kill book was published in 2017 and both FMCS and AFS are committed to doing revisions on a 10-year cycle. Based on current information it seems that the plan will be to solicit funding in 2026 and do the work in 2027 with a publish date of late 2027 or 2028. One of the primary questions to be answered as we move forward is, "How do you use the kill book?"
In open discussion the following answers were given:

- Determining the value of hatchery raised mussels that are stocked – Jim Intihar
- The cost or value of a fish kill – Erica Beason
- Calculating the settlement number for FERC relicensing – Matt Ashton
- Calculating the value of Western US mussels – Alexa Maine
- Calculating the cost of mitigation projects, animal replacement costs – Brian Watson
- Value of fish kills in Michigan – Daelynn Woolnough

It was explained that for the second edition a survey was sent to all known production facilities to submit their mussel production and culture costs. Ultimately the numbers were averaged and published by genus. This was done to 'hide' Federally Endangered species as

they should have a higher value established by Ecological Services. Any genus completely comprised of Federally Endangered species was not given a published price in the book. Discussion followed on any complaints about the previous process or how the second edition of the book could be improved. One person liked the genus level approach, while one other preferred listing the individual species. Someone asked about habitat and whether habitat type was considered in this process. Habitat was not part of the equation for generating numbers. It was suggested that the HEA (Habitat Equivalency Analysis) process be included in the next edition as either an index or listed in fine detail within a chapter.

The final request was for volunteers to form a steering committee to carry this task forward through the upcoming process. Nathan offered to head up this task as the Restoration Chair. Alexa Maine offered to represent the Western Mussel group. No other volunteers stepped forward so Nathan will **guilt a few suckers** into helping.

In closing a member asked if there was a review paper on Propagation or Restoration and the potential of developing one and hosting it on the website with some bibliography of references. AI review paper isn't available on our website, but they were referred to in the propagation book which was published by NCTC. It was suggested that this might be a task for the guidelines and techniques committee. Additional discussion followed about community sharing ideas, successes and failures, specifically on the freshwater mussel propagation Facebook Group which is run by Chris Eads and used by many members of the committee. Jesse closed the meeting with a plug for joining the Habitat Restoration and Protection sub-committee. Jesse will schedule a meeting for members to discuss what members would like to see from this subcommittee and establish tasks and priorities.

Field Studies & Ecosystems Committee

- The Field Studies and Ecosystems Committee met at the FMCS Biennial Symposium to discuss the committee's ongoing initiatives related to the society journal, Freshwater Mollusk Biology and Conservation. Most discussion centered on efforts to institute a formal data availability statement at FMBC. This effort has been paused during the editorial transition that the journal is undergoing but will resume once the new editor-in-chief takes over. Given that committee leadership is composed mostly of academic scientists, we listened to the needs and concerns of private sector and government agency members who have different restrictions on posting public data compared to academics and will incorporate this feedback into our efforts moving forward.

- We also discussed efforts to create a "survey paper" submission format for FMBC that would allow the publication of short-format, peer-reviewed publications that are designed to report information on mollusk survey results without the time commitment required to write a full scientific article. These papers would focus on the study sites, methodologies, and results, with minimal introduction/discussion requirements. This effort was similarly paused during the editorial transition but expected to resume this summer.

Genetic Committee

The FMCS Genetic Committee met in person during the FMCS Symposium in May, with a total of 30 attendees. The committee focuses on genetics-related issues in freshwater mollusk research and conservation. During the meeting, we discussed the deposition of unpublished genetic data into public repositories such as GenBank, the possibility of developing a reporting system for erroneous or questionable genetic data in GenBank, and the importance of vouchering specimens and sampling from type localities. We recognized the growing demand for genetic resources to support DNA barcoding and environmental DNA (eDNA) research, which require comprehensive reference datasets and high data accuracy. The committee also discussed the need to develop standardized protocols for genetic sampling of mussels and gastropods. This protocol document will be made publicly available to support practitioners collecting genetic samples. Lastly, the committee elevated Kentaro Inoue as their Chair, replacing Nathan Johnson, and chose Sean Keogh and Jamie Bucholz as new co-chairs. We plan to hold periodic virtual meetings moving forward.

Names Subcommittee

The Bivalve Subcommittee of the FMCS Scientific and Common Names Technical Committee met on Monday, May 12 at the biennial symposium. Ten names' petitions were considered and voted upon, and subsequently, the draft 2025 Bivalve Names list has been updated and distributed to subcommittee members for review. The subcommittee anticipates the FMCS 2025 Names List being posted to the website by mid-June 2025.

The subcommittee chose John Pfeiffer as their new Chair, replacing John Harris. Alison Stodola joined as a new member. The current members and their term expiration dates are:

- John Pfeiffer, Chair (2031)
- Arthur Bogan (2027)
- Andrew Henderson (2029)
- Nathan Johnson (2029)
- Kevin Roe (2029)
- Alison Stodola (2029)
- David Zanatta (2027)

The Gastropod Subcommittee of the FMCS Scientific and Common Names Technical Committee met via-TEAMs on Wednesday, May 7th. Twenty-five names' petitions were considered with 20 adopted. The updated gastropod list will not be available until pending publication in FMBC in either late 2025 or 2026.

The subcommittee chose Nathan Whelan as their new Chair, replacing Paul Johnson. The Current members and their term expiration dates are as follows:

- Nathan Whelan, Chair (2031)
- Jeff Garner (2029)
- Ken Hayes (2027)
- Paul Johnson (2029)

- Chuck Lydeard (2029)
- Kathryn Perez (2027)
- Ellen Strong (2029)

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

Functional Committees

Awards
Curt Elderkin - elderkin@tcnj.edu
David Hayes - david.hayes@eku.edu
Susan Oetker - susan_oetker@fws.gov

Chapters
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Manuel Lopes-Lima - manuelpmlopeslima@gmail.com

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Brian Carlson – brian.carlson85@gmail.com

Finance
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Nathan Click – nathan.click@ky.gov

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Field Studies and Ecosystems
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Carla Atkinson - carlalatkinson@gmail.com

Genetics
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Kentaro Inoue – kinoue@sheddaquarium.org

Mollusk Status and Distribution
Jason Wisniewski - jason.wisniewski@tn.gov
Wesley Daniel - wdaniel@usgs.gov

Parting Shots

Submitted by Avery Millard

The Tennessee Aquarium's new freshwater mussel exhibit opened on April 4th, 2025. We are currently displaying three Duck River species: *Cyclonaias tuberculata*, *Obliquaria reflexa*, and *Cambarunio taeniata.* Thank you to the freshwater mussel community in the Southeast for your advice and expertise. **Photo by Doug Strickland at Tennessee Aquarium.**

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 Ellipsaria@gmail.com.