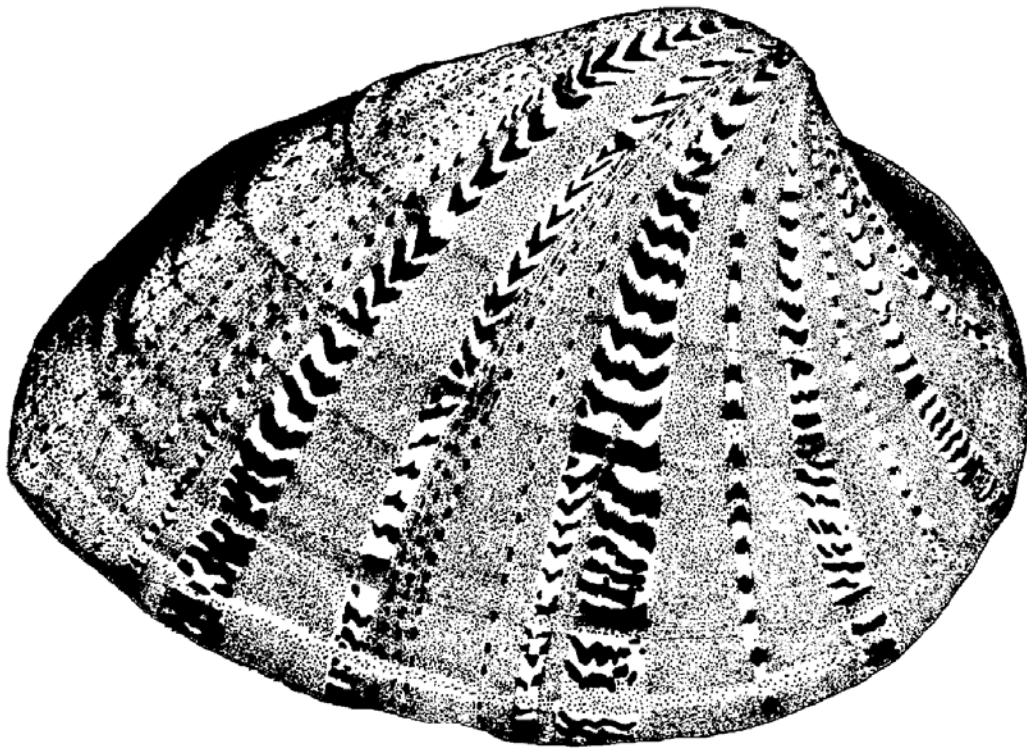


Ellipsaria

The Newsletter of the Freshwater Mollusk Conservation Society

Volume 8 - Number 2

August 2006



In this issue:

2007 Symposium & Award Nominations
Freshwater Mollusk Bibliography
Membership List

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Submissions for the December 2006 issue of *Ellipsaria* may be sent to the editor at any time but are due by November 3, 2006. Anyone may submit an article but you must be a member of FMCS to receive *Ellipsaria*. Please limit submissions to about one page. Categories for contributions include news, new publications, meeting announcements, current issues affecting mollusks, job postings, contributed articles (including ongoing research projects), abstracts, and society committee reports. Electronic submissions are preferred; contact the editor with any questions. Note that submissions are not peer reviewed, but are checked for content and general editing.

Thanks to Jeremy Tiemann for help assembling and mailing this newsletter.

Please send change of address information to the Secretary, Patty Morrison.

Ellipsaria

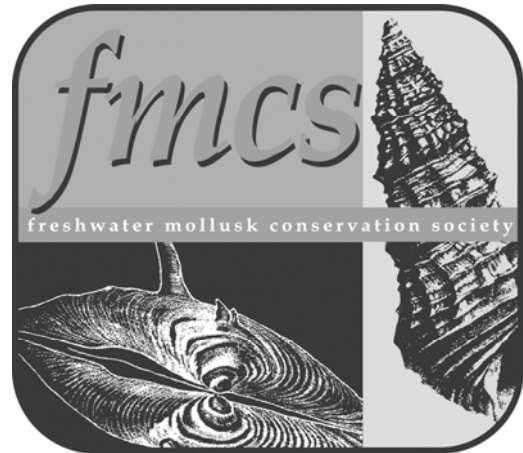
NEWSLETTER OF THE FRESHWATER MOLLUSK CONSERVATION SOCIETY

Volume 8, No. 2

<http://ellipse.inhs.uiuc.edu/FMCS/>

August 2006

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<p>FMCS 2007 WORKSHOP & SYMPOSIUM MARCH 11 – 15, 2007 THE PEABODY LITTLE ROCK LITTLE ROCK, ARKANSAS</p>

The 5th Biennial Symposium of the Freshwater Mollusk Conservation Society will be held at The Peabody Little Rock hotel in Little Rock, Arkansas from March 13-15, 2007. A one-day FMCS sponsored workshop on Habitat Restoration will be conducted prior to the symposium on Monday, March 12. The theme for the 2007 symposium is:

Directions in Mollusc Conservation: Molecules to Ecosystems

A plenary session will open the symposium to provide a summary of current knowledge and directions for the future of freshwater mollusk conservation. This plenary session is timely as the Society is currently redrafting its primary guidance document, and the plenary session has been chosen to help set the tone for the next 5 to 10 years of research and conservation.

Eight major topic areas have been selected:

- 1) Freshwater Mussel Evolution, Taxonomy, and Systematics,
- 2) Freshwater Mussel Life-History Strategies,
- 3) Freshwater Mussel Population Ecology,
- 4) Freshwater Mussel Community and Food Web Ecology,
- 5) Freshwater Mussel Landscape Ecology,
- 6) Freshwater Mussel Ecosystem Ecology,
- 7) Freshwater Mussel Conservation Directions, and
- 8) Gastropoda Ecology and Conservation Directions.

INSTRUCTIONS FOR AUTHORS

~ Call for Abstracts ~

We are requesting abstracts associated with the previous topics and others associated with the following topics: Habitat and Conservation, Range-wide Status and Distribution, Life History and Ecology, Evolution and Phylogenetics, Outreach and Education, Propagation and Reproduction, Recovery, Contaminants and Water Quality, or any other mollusk related work.

Instructions for Abstract Preparation and Submittal

Submittal form: Abstracts should be submitted as an email attachment in Microsoft Word® or Rich Text format to Alan Christian at achristian@astate.edu. The file name should include the presenter's last name and initials (e.g., **jonesjm.doc**). Acknowledgment of abstract receipt, if requested, will be provided by e-mail.

Limit abstracts to 300 words or less (including title, authors, and affiliations). Abstracts with greater than 300 words will be edited.

The abstract should contain the title in **BOLD, CAPITAL** letters, followed by the author(s) and their address(es). Underscore the presenter's name. Skip one line and begin the text (see example below) including a clear summary of presentation including objectives, results, and conclusions:

MICROSATELLITE VARIATION IN POPULATIONS OF *LAMPSILIS CARDIUM* FROM THE UPPER MISSISSIPPI RIVER, Emy Monroe¹, Teresa Newton², and David J. Berg³. ¹Department of Zoology, Miami University, Oxford, OH 45056; ²Upper Midwest Environmental Sciences Center, LaCrosse, WI, 54601. ³Department of Zoology, Miami University, Hamilton, OH 45011

Conservation of imperiled unionids requires maintaining genetic diversity. Microsatellite markers were used . . .

At the bottom of the page, type:

1. The name, address, telephone, fax, and e-mail of the presenting author
2. Preference for Platform or Poster presentation and willingness (yes or no) to convert from one format to another
3. Regular or Student* attendee

*Note: All students submitting abstracts, provided they meet eligibility requirements (see accompanying newsletter article), will be judged for the best student platform or poster presentation, unless otherwise indicated.

Oral Presentation Requirements

Not to exceed 20 minutes (15 minutes for talk and 5 minutes for questions and answers). Slides and LCD projector visual aids only (no overheads).

Poster Requirements

The poster should be readable from 5 feet, titles from 10 feet. The poster should not exceed a size of 4 feet high by 8 feet wide. Authors must be present at the poster session.

ABSTRACTS MUST BE RECEIVED BY DECEMBER 1, 2006

REGISTRATION

Registration for the FMCS 2007 Symposium received prior to **February 1, 2007** is \$225 for regular or supporting members and \$175 for student members. Registration is \$255 for non-members and \$190 for student non-members if received before February 1, 2007. Substantial increases will be required for all registrants after February 1.

Please download, fill out, and electronically submit the forms for registration and accommodations via the FMCS web site at <http://ellipse.inhs.uiuc.edu/FMCS/symposium/>. Alternatively, call (870-972-3296) or email (achristian@astate.edu) Alan Christian.

ACCOMMODATIONS

The Peabody Little Rock rate is \$119 per night, single or double occupancy; \$129 for triple and quadruple occupancy. Rooms must be booked by **February 9, 2007** to guarantee this rate. Check-in time is 3 p.m. and check-out time is 12 noon. The Peabody Little Rock is located along the Arkansas River at Three Statehouse Plaza on the corner of Main and Markham streets in downtown Little Rock. The Peabody Little Rock will be handling all of the housing arrangements. Call 501-906-4000 (FAX 501-375-4721) for room reservations and use the meeting code of **FMCS2007**.

Please plan to book your room with The Peabody Little Rock hotel. FMCS meeting room rental costs are based upon the number of hotel rooms booked by members. We need to book at least 125 rooms each night to ensure reasonable meeting room costs. Also, please remember to tell the Little Rock Convention Bureau receptionist you are attending the FMCS symposium when making your reservations so the society will receive credit for the rooms reserved.

Airport Shuttle

The Peabody Little Rock provides complementary shuttle service from the airport. Shuttle service can be arranged by calling the hotel from the airport via their complementary phone line located near baggage claim or by calling the hotel directly at 501-906-4000.

Hotel or City Parking

The hotel valet parking (24 hr.) is \$13.50/day for registered hotel guests. Day use of the hotels valet parking services is \$10.00 per day. Self-parking is available at \$7.50 per day at the city operated parking garage located at the corner of 2nd and Main Street, approximately two blocks from the hotel.

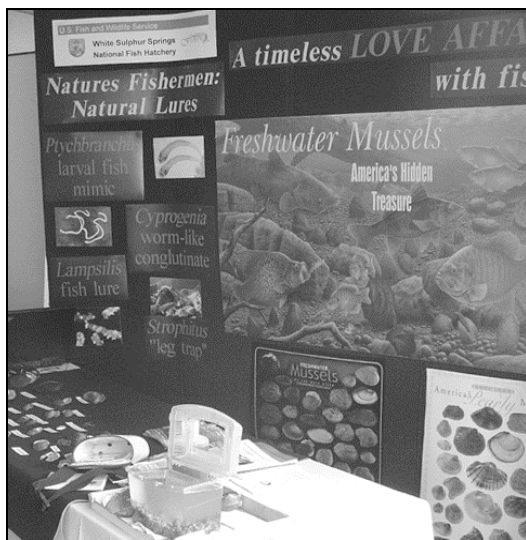
Student Travel Awards Available for 2007 FMCS Symposium

CALLING ALL STUDENTS (both undergraduate and graduate)... To facilitate your participation in the 5th Biennial Symposium of the Society to be held March 11-15,

2007 in Little Rock, Arkansas, travel awards are being offered by the Society. Support is provided via an award of \$100 to \$300 (actual amount depends on the number of qualified applicants) to help defer the cost of travel and accommodations. It is anticipated that approximately 10 to 30 awards will be made for the 2007 Symposium. A complete application package must be submitted to Dr. W. Gregory Cope, FMCS Awards Committee, North Carolina State University, Department of Environmental and Molecular Toxicology, Box 7633, Raleigh, NC 27695-7633 on or before **December 15, 2006**. For more details, see: <http://ellipse.inhs.uiuc.edu/FMCS/Awards/> Contact Dr. Greg Cope at greg_cope@ncsu.edu or at 919.515.5296 for more information.

Call for 2007 FMCS Professional Award Nominations

Do you know someone who has made worthwhile contributions to mussel conservation or to the Society either through donating their professional time or expertise or through their scientific endeavors? Consider nominating them for one of the FMCS Professional Awards. Nominations and supporting documentation are due on **December 31, 2006**. See the Awards Committee web site at <http://ellipse.inhs.uiuc.edu/FMCS/Awards/> for more details. Contact Dr. Greg Cope at greg_cope@ncsu.edu or at 919.515.5296 for more information.



The FMCS freshwater mussel outreach display goes on tour

Julie L. Devers
White Sulphur Springs National Fish Hatchery, WV

The FMCS outreach display made an appearance at the 2006 Congressional Casting Call on April 24th in Washington, DC. The Congressional Casting Call is an annual event designed to give members of congress and their staff an

opportunity to go fishing on the Potomac River and meet with fisheries professionals. In addition, the National Fish Habitat Action Plan was officially launched at this event.

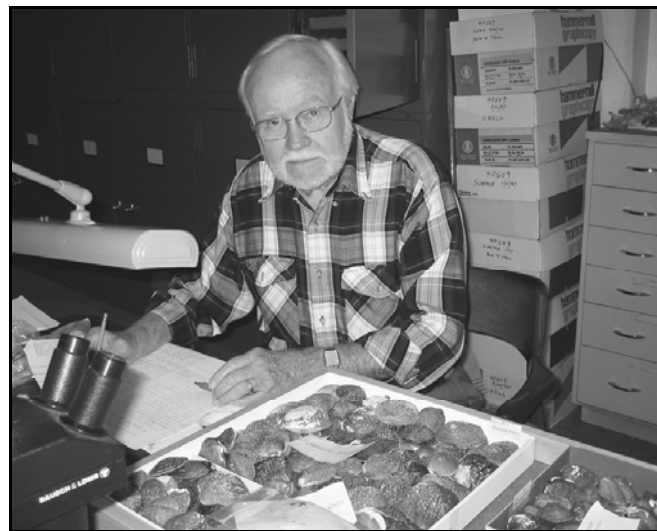
Congressional folks as well as Washington office employees from a number of agencies and non-profit organizations were amazed by freshwater mussels. The display, presented by the staff of the White Sulphur Springs National Fish Hatchery, featured an enlargement of the poster "Freshwater Mussels: America's Hidden Treasure", information about the life history of freshwater mussels, and several beautiful pictures of displays and lures. The FMCS display was slightly altered for the event to provide information about the fish hatchery. In addition to the FMCS panels, freshwater mussel shells and a slide show highlighting the freshwater mussel life cycle were on display.

The FMCS panel display is available for members to use at outreach events. It is currently being housed at the White Sulphur Springs National Fish Hatchery. Please contact either Matthew Patterson (Matthew_Patterson@fws.gov) or Julie Devers (Julie_Devers@fws.gov) at 304-536-1361 to request the display for your outreach event.

Obituary

Former UT McClung Museum Director Paul Parmalee Dies

KNOXVILLE -- Paul W. Parmalee, University of Tennessee professor emeritus and a pioneer in the scientific field of zooarchaeology, died today [July 4, 2006] of complications from a stroke. He was 79.



Parmalee was recruited from the Illinois State Museum to the UT faculty in 1973 by famed UT anthropologist Dr. William Bass. Parmalee took on the additional role of director of McClung Museum from 1977 to 1989, when he retired from the classroom, but not from work. Parmalee increased his research and publication schedule, co-

authoring in 1998 the definitive book *The Freshwater Mussels of Tennessee*, published by UT Press. Parmalee was writing up his latest fieldwork at his desk in his museum office when he suffered the stroke several weeks ago.

“UT was unimaginably fortunate to have attracted Paul Parmalee to its faculty. His stature in the field has brought to the university outstanding students and world-renown scientists, and to McClung Museum a priceless collection of freshwater mussel specimens recognized as the best collection in the eastern U.S.,” said Chancellor Loren Crabtree. “Such a valuable professional and beloved individual is impossible to replace, but we are certain that the power of his positive presence will continue to inspire generations of scientists.”

Born in Mansfield, Ohio in 1926, his interest in studying plants and animals started in boyhood. He joined the Army in 1944 at age 18, serving in the Philippines and Japan. Then his formal education began at Ohio University where he earned a bachelor’s degree in zoology in 1948. Then he earned a master’s in ecology from the University of Illinois in 1949 and a doctorate degree wildlife management from Texas A&M in 1952.

In 1953, he became curator of zoology for the Illinois State Museum in Springfield. There he established the critical importance of zoological fieldwork at archaeological sites and created interdisciplinary connections to explore the interplay of humans and nature. He became an expert in identifying even the smallest remnants, with special focus on bones, birds and freshwater mussels.

When Parmalee left Illinois for Tennessee in 1973, he was assistant museum director and he had built the best specimen and skeleton collection in the Midwest, according to his colleagues there.

He is preceded in death by his first wife, Barbara Griswold Parmalee, in 1991. Survivors include Parmalee’s wife, Geneva Nail Wyatt Parmalee; son and daughter-in-law, J. David and Elizabeth Parmalee, and granddaughters Katherine and Corinne of Knoxville; daughter and son-in-law, Patrice and Michael Fox, grandson Austin and granddaughter Kelsey of Fairview, Tenn.; daughter and son-in-law Shalee and David Sojka and granddaughter Sophia of Crossville, Tenn.

Preservation of Parmalee’s extensive freshwater mussel collection, about 65,000 specimens, has been assured, according to Jeff Chapman, who is now director of McClung Museum. “The collection will be named The Paul W. Parmalee Malacology Collection, and a fund has been established for its care and support. Chapman said the collection is essential to the work of students, faculty and scientists from the Tennessee Wildlife Resources Agency, the Tennessee Valley Authority and numerous businesses.

Contributions should be made to the McClung Museum, 1327 Circle Park Drive, Knoxville, TN 37996-3200 and designated for the Parmalee Fund. Parmalee will be interred at Evergreen Cemetery in Camp Point, Ill.

Additional Remembrances from Colleagues

Countless colleagues and friends also assure preservation of Paul Parmalee’s memory. His story begins and ends with people and work that he loved.

Dr. Bonnie Styles, director of the Illinois State Museum (ISM) said that he inspired her as a graduate student to pursue zooarchaeology as a specialty. “I had the good fortune to study faunal remains from two archaeological sites that he had studied earlier. His identifications and interpretations have withstood the test of time,” she said, “I loved his sense of humor and the twinkle in his eye. He was so vibrant. You just knew when he was about to tell a joke.”

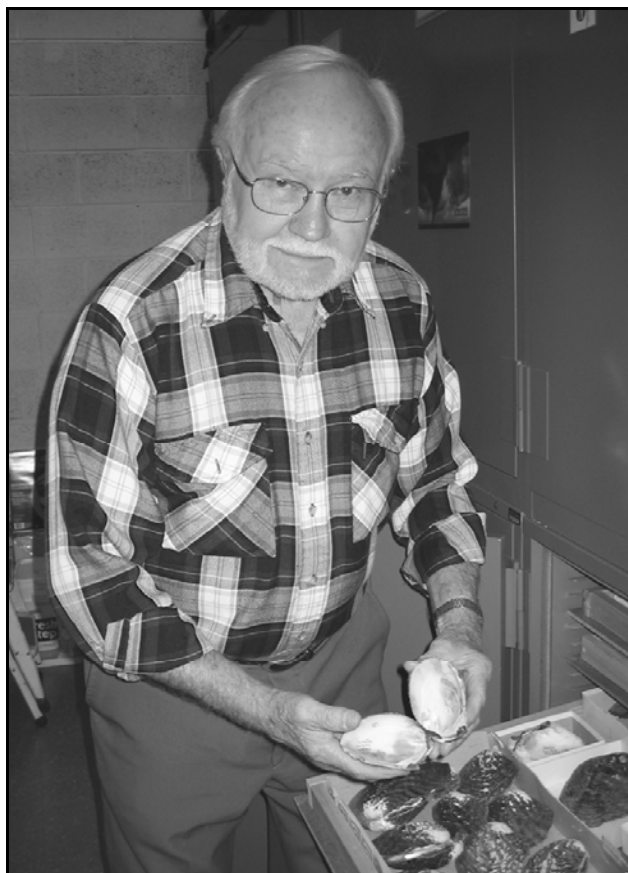
Another long-time friend and colleague, emeritus ISM director Dr. Bruce McMillan, said Parmalee’s career was characterized by creativity and precision. “He had an eclectic, holistic approach yet advocated careful and accurate identifications and the need for comprehensive comparative collections to help researchers in all the natural sciences, McMillan said. “I first met Parmalee in 1961 when he was working on Tick Creek Cave, an important faunal site in central Missouri. He was an outstanding scientist with an indefatigable spirit, constantly working and pushing forward,” McMillan said.

Orvetta Robinson, retired librarian for the Illinois State Museum met Parmalee when he joined the ISM staff in 1953. “Paul’s friendship and support during our years of association at the Illinois State Museum contributed more than he knew to my self confidence and growth in my position. He was always there for me with advice or assistance, should I ask, and with unwavering friendship in recent years as well,” she said.

His associations at the University of Tennessee proved to be just as solid. Dave Etnier, UT emeritus professor of zoology, and Parmalee bonded quickly. Etnier came in 1967, Parmalee six years later. “We were both Midwestern. Both naturalists, both duck hunters, both a little bit unconventional. I’m from Minnesota, and Paul spent much of his time in the Midwest. We hit it off right away. He’s the best hire we’ve ever made. He’s done so much for our university. He was prouder of his students and what they’ve done than of his own extensive publications record. He has sent out zoologists to the rest of the world, my son Michael being one of them.”

Art Bogan, coauthor with Parmalee of the Tennessee mussels book, was Parmalee’s first doctoral student at Tennessee, graduating in 1980. He spent 12 years at the Academy of Natural Sciences in Philadelphia before becoming research curator of invertebrates at North Carolina Museum of Natural Sciences in Raleigh. Bogan says while working at UT he and Parmalee prepared skeletons ranging in size from a little darter to a full grown ostrich. “Dr. Parmalee had a feel for the bones, recognizing subtle differences that are hard to quantify. When Paul was asked why he had identified a bone as a duck he would reply ‘because it looks like a duck.’ He was happiest collecting clams, or mussels. He bought a used, pink, flat bottom boat

one time, and named it Sissypoo, even though he repainted it green. We had great fun taking it out onto Chickamauga Reservoir even on cold, winter days. He had to be reminded when it got dark that it was time to stop for the day.” Bogan said Parmalee was the quintessential collector, his academic skills extending beyond the realm of zoology to patent medicine bottles, Civil War stamps, and even antique meat grinders. “He instilled in his students the responsibility to publish, to share knowledge. Even now, if I’m not writing, I feel like I’m off track.”



Gerry Dinkins, another former student and co-owner of Dinkins Biological Consulting, accompanied Dr. Parmalee on fieldtrips in recent years. In fact, they had another one planned. Dinkins was a 1980 UT grad in wildlife and fisheries and earned a master’s in ecology in 1984. “The day before his stroke I was in his office with some stuff to puzzle over. We were looking forward to a survey in the Elk River of W. Va. We’d done a survey in the New River last year. When I visited Paul at the hospital during the last weeks of his life, we sat and listened to opera,” Dinkins said. “Dr. Parmalee was so generous with his time and expertise. Bring him any kind of shell, most common or most rare, anything from pristine to an old relic, and he would always treat it as a real find. When my professional relationship began with Paul I had just moved back to Tennessee and became very busy conducting surveys for endangered aquatic species. We began collaborating, and I never ceased to be amazed at the depth of his knowledge. He was truly one of the giants in this field. UT was so, so lucky to have him,” Dinkins said.

Another zoologist keenly influenced by Paul Parmalee’s work and friendship is Dr. Don Grayson, professor at the University of Washington in Seattle. “When I was in graduate school at Oregon, I looked to the work of two people to provide models for what I wanted to do: Paul Parmalee and John Guilday, paleontologist at Carnegie Museum of Natural History. They often co-authored publications. I read everything they had ever written, and still return to their work routinely. I was fortunate enough to meet Paul at an archaeology society meeting in the early 80s. He and I quickly became friends, but that doesn’t distinguish me from hundreds of others: It was hard, maybe impossible, to know Paul without being his friend. Although Paul was important to me professionally as a role model, it isn’t Paul the zooarchaeologist that I will miss nearly as much as Paul the person. In addition to being a consummate scholar, Paul was one of the most interesting, most enjoyable people I have ever met. I was lucky not to have been a clam within his collecting radius, though if I had been, I would have ended up well-labeled and perfectly curated. My most fervent wish for Paul is that when he arrives where he is going, there will be birds to watch, clams and stamps to collect, cigars to smoke, and maybe even some of his other favorite activities as special dispensation for a life well and importantly loved,” Grayson said.

Soon after he arrived in Tennessee in 1973, Parmalee persuaded ISM archaeologist Dr. Walter Klippel to join him at UT. The scientific community has greatly benefited from the partnership. Klippel, a UT anthropology professor, and Parmalee have co-authored many publications over the years. Perhaps more importantly, said Klippel, “Paul was able to convince me of the importance of systematic collections in zooarchaeology, and after he assumed directorship of McClung Museum we collaborated on a successful National Science Foundation proposal to further increase the usefulness of UT’s vertebrate skeletal collection in anthropology. Paul’s practical approach to scholarship was to integrate publication activities with a constant effort to improve comparative collections. He has left the university with one of the best research/teaching collections in North America. We will, however, sorely miss his sage advice when it comes time to identify those difficult to identify specimens that he was so willing to assess for colleagues, students, and the general public,” Klippel said.

Dr. James Purdue, another long-time associate from IL, said, “I had the good fortune to follow Paul Parmalee as a curator of zoology at Illinois State Museum. Paul was a good friend and colleague and was a pleasure to work with. He had a quick intellect and an even better sense of humor. The academic institutions he served, namely the Illinois State Museum and the University of Tennessee, are better places because of Paul’s contributions. Many of us have lost a good friend, but Paul’s legacy will live for decades to come.”

Purdue was an editor, with Klippel and Styles, of a 1991 book, or festschrift, containing 31 scientific papers Parmalee’s friends and colleagues published as tribute to his career. They surprised him with their plan at the Sixth

International Conference of the International Council for Archaeozoology held in 1990 at the Smithsonian Institution.

Dr. Parmalee's response to the honor sums up his extraordinary life, says Art Bogan. "I thought I was just having fun," Parmalee said.

University of Tennessee Communications, July 4, 2006 (865-974-2225)

Another obituary can be found in the *Knoxville News-Sentinel*, Wednesday, July 5, 2006, page B7, or <http://www.legacy.com/KnoxNews/Obituaries.asp?Page=LifeStory&PersonId=18357490>

Publications

Gooding, M.P., T.J. Newton, M.R. Bartsch, and K.C. Hornbuckle. 2006. Toxicity of synthetic musks to glochidia and juvenile life stages in the freshwater mussel *Lampsilis cardium*. *Archives of Environmental Contamination and Toxicology*: in press.

Morales, Y., L.J. Weber, A.E. Mynett, and T.J. Newton. In press. Mussel dynamics model: a tool for analysis of freshwater mussel communities. *Ecological Modelling*.

Morales, Y., L.J. Weber, A.E. Mynett, and T.J. Newton. In press. Effects of substrate and hydrodynamic conditions on the formation of mussel beds in a large river. *Journal of the North American Benthological Society*.

Newton T.J. and W.G. Cope. 2006. Biomarker responses of unionid mussels to environmental contaminants. Pages __ to __ in *Freshwater Bivalve Ecotoxicology*, J.L. Farris and J.H. Van Hassel, eds., SETAC Press, Pensacola, FL and Taylor & Francis, Boca Raton, FL: in press.

The Mollusks: A Guide to Their Study, Collection, and Preservation

The American Malacological Society has published "The Mollusks: A Guide to Their Study, Collection, and Preservation". The guide is 445 pages with 101 figures and has 29 international contributors. The volume was edited by C. Sturm, T. Pearce, and A. Valdes and includes chapters on collecting and cleaning shells, archival methods, digital and film imaging, dredging, and cladistics, and molecular techniques. There are also chapters covering all 7 extant classes of mollusks as well as fossil mollusks. Revenue from the book will help defray the costs of the scientific program, student scholarships, and grants; AMS earns more if you order directly from the publisher (\$35.95).

<http://universal-publishers.com/book.php?method=ISBN&book=1581129300>
or <http://tinyurl.com/r3vma>

Michigan's Wildlife Action Plan Online

The Michigan Department of Natural Resources has completed "Michigan's Wildlife Action Plan" which includes bivalves and both aquatic and terrestrial gastropods. PDFs are available through the Michigan DNR web site:

<http://www.michigan.gov/dnr>

To go directly to the plan: <http://tinyurl.com/hbb3b>

Freshwater Mussels of Michigan Poster

Peter Badra of the Michigan Natural Features Inventory has put together a poster and accompanying brochure on the Freshwater Mussels of Michigan. The project was supported by the Michigan State University Extension, the Michigan Department of Environmental Quality, and the NOAA. The poster is "framing quality" and the brochure does an excellent job of informing the public about the importance of these creatures and the various threats to their continued existence. Copies are available for \$3 from:

Michigan Natural Features Inventory

Stevens T. Mason Bldg.

P.O. Box 30444

Lansing, MI 48909-7944

<http://web4.msue.msu.edu/mnfi>

Contributed Articles

The following articles were contributed by FMCS members and others in the malacological community. The contributions are incorporated into the newsletter with minimal editing and the opinions expressed therein are those of the authors.

Does the Eastern Elliptio (*Elliptio complanata*) form an annulus every year?

D.H. Kesler and W. Sheftall

Rhodes College, Memphis, Tennessee 38112

Mussel biologists have long used external and internal annuli or rings to determine mussel growth rates and longevity – the assumption being that one annulus is formed per year. Downing, et al. (1992) challenged this assumption through a review of the literature and through a marking experiment. I contributed to this challenge by comparing growth rates inferred from the spacing of internal annuli and to direct measurements of shell length changes (Kesler and Downing 1997). As we work to protect this imperiled faunal group, it seems ironic that the assumption of yearly annulus formation has not been more thoroughly tested.

We tested the assumption of yearly annulus formation with a group of marked adult Eastern Elliptio (*Elliptio complanata*)

in southern Rhode Island. These shells were measured and painted with Krylon paint in 1997-1999 and the individuals grew for 5-7 years. We were thus able to compare the number of annuli formed since marking with the number of years since marking.

We thin sectioned 76 shells from 46 individuals and viewed these microscopically at 7-40x magnification. When marked, these individuals were all adults with shell lengths ranging from 39.0-72.7 mm, averaging 62.6 (\pm 1.1 s.e.) mm. Their average growth rate over the 5-7 years was 2.03 (\pm 0.18 s.e.) mm/y.

Our determination of annual rings in the shells differed from the expected number in 28 out of the 76 sections. On average, we counted 0.11 (\pm 0.10 s.e.) rings more than the expected number. We subsequently re-evaluated the 28 sections we had misread and refined our criteria for recognizing true rings. An annulus was identified by a raised bump protruding from the prismatic layer (A in Fig. 1) into the nacreous layer (B in Fig. 1). In the best-case scenario, a dark line was continuous from the nacreous layer through the prismatic layer, as in Fig. 1. If the line was not continuous, we looked for two rings close to each other, where the first ring formed was lighter in color, followed by a darker ring. Sometimes these rings were fragmented, one of them not penetrating the prismatic layer.

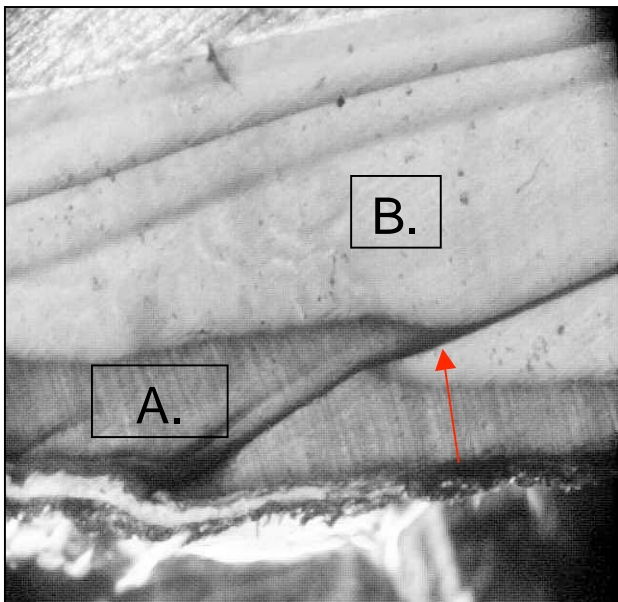


Fig. 1. Thin section of an Eastern *Elliptio* (*Elliptio complanata*) shell. The prismatic layer is indicated by "A" and the nacreous layer by "B". The arrow indicates a best-case scenario of an annulus.

We were able to apply these criteria to all but one shell. We conclude that, using these criteria, the freshwater mussel *E. complanata* does form growth rings annually. This result is consistent with the recent report of Commens and Haag (2005) in which they found annual shell ring formation to occur consistently across species, space, and time. While we are confident we have demonstrated that the *E. complanata*

we evaluated do form annuli yearly, reading these rings is not a trivial activity.

References Cited

- Commens, A.M. and W.R. Haag. 2005. Validating the assumption of annual shell ring deposition in freshwater mussels. *Bulletin of the North American Benthological Society* 22:434.
- Downing, W.L., J. Shostell, and J.A. Downing. 1992. Non-annual external annuli in freshwater mussels *Anodonta grandis grandis* and *Lampsilis radiata siliquoidea*. *Freshwater Biology* 28: 309-317.
- Kesler, D.H. and J.A. Downing. 1997. Internal shell annuli yield inaccurate growth estimates in the freshwater mussels *Elliptio complanata* and *Lampsilis radiata*. *Freshwater Biology* 37: 325-332.

Release of the federally endangered Northern Riffleshell into Big Darby Creek, Ohio

Kody F. Kuehn¹, G. Thomas, Watters¹, Trisha Menker-Gibson¹, C. Brooke Smith¹, and Doug Warmolts²

¹Department of Ecology, Evolution, and Organismal Biology, The Ohio State University, 318 W. 12th Avenue, Columbus, Ohio 43212.

²Columbus Zoo and Aquarium, 9990 Riverside Dr., Powell, Ohio 43065.

The Northern Riffleshell is a federally endangered freshwater mussel that once lived in many of Ohio's rivers. Habitat loss and numerous other factors have all but extirpated this animal from the state as well as from the vast majority of its historic range. As a result of this trend, the Columbus Zoo and Aquarium, in partnership with the Ohio State University, US Fish and Wildlife Service, ODNR Division of Wildlife, and Columbus Metro Parks, has successfully propagated this species at the Zoo's Freshwater Mussel Research and Conservation Facility. On Thursday June 1st 2006, the first step in reclaiming this species occurred as juvenile Northern Riffleshell were returned to the wild, marking this as the first ever release of an endangered mussel species into Ohio waters.

The release consisted of forty day old juvenile Northern Riffleshell and 13 fishes (2 Rainbow darters, 2 Greenside darters, 1 Banded darter, and 8 Mottled Sculpin) infested with Northern Riffleshell larvae. Previously identified hosts for the Northern Riffleshell include the Mottled Sculpin and Banded Darter. All juvenile mussels and fishes were released into an experimental mesh cage anchored to the substrate of Big Darby Creek. Transformation will continue to take place in the cage and the excysted juveniles will collect on the bottom sediment-covered tray. The cage will be left in place until Fall 2006 when it will be checked for success (or failure). The fishes were infested and monitored for juvenile excystment at the Freshwater Mussel Research and Conservation Facility prior to their release into Big Darby Creek.

The project, funded by the Ohio Division of Wildlife and the U.S. Fish and Wildlife Service is part of a three year endeavor to augment and reintroduce Northern Riffleshell and Clubshell into selected areas of Illinois and Ohio. The first year of the project identified potential broodstock, selection of sites for augmentation and reintroduction, propagation of surrogate species, as well as an opportunity to begin augmenting Northern Riffleshell in Ohio. The next two years of the project will be spent propagating both Clubshell and Northern Riffleshell for release into the previously identified systems in Illinois and Ohio.

Host identifications or confirmations

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All transformations at 20° C unless noted otherwise.

* - apparently new host identification.

Studies funded through the Ohio Division of Wildlife and the US Fish and Wildlife Service.

1) *Epioblasma rangiana* (May) - 18° C

Suitable hosts:

Mottled Sculpin (days to transformation – 25;
% transformed – 5 to 93%)

Banded Darter (days to transformation – 25;
% transformed – 3%)

2) *Quadrula cylindrica cylindrica* (May)

Suitable hosts:

Rainbow Darter (days to transformation – 26;
% transformed – 12%) *

Spotfin Shiner (days to transformation – 26;
% transformed – 4%) *

Hosts yielding no transformation:

Banded Darter, Creek Chub, Greenside Darter,
Logperch

3) *Strophitus undulatus* (March)

Suitable hosts:

Banded Darter (days to transformation – 23;
% transformed – 4 to 5%)

Logperch (days to transformation – 20;
% transformed – 13 to 23%) *

Brown Bullhead (days to transformation – 20;
% transformed – 92%) *

4) *Venusticoncha ellipsiformis* (May)

Suitable hosts:

Banded Darter (days to transformation – 24;
% transformed – 60%)

Hosts yielding no transformation:

Greenside Darter, Rainbow Darter

5) *Villosa taeniata* (April)

Suitable hosts:

Smallmouth Bass (days to transformation – 28;
% transformed – 2%) *

Hosts yielding no transformation:

Banded Darter, Goldfish, Greenside Darter,
Logperch, Silver Shiner

Ligumia subrostrata (Say 1831) records from the upper Mississippi River

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At least 50 unionoid species have been recognized from the upper Mississippi River (Fuller 1980). Among the species Fuller thought extirpated from, or at least extralimital to, the Mississippi River mainstem was *Ligumia subrostrata*.

Ligumia subrostrata is essentially a small stream and pond species. However, since this species can resemble young *Ligumia recta* (Lamarck 1819) except for the thinness of the shell (Coker 1919), records over the past 40 years suggest that *L. subrostrata* and perhaps other rare species may be overlooked in the Mississippi River. In view of relatively recent records for *L. subrostrata*, rare species such as *Leptodea leptodon* (Rafinesque 1820), *Simpsonaias ambigua* (Say 1825) and *Potamilus capax* (Green 1831) may not always be recognized.

Ligumia subrostrata, referred to as *Unio mississippiensis* (Conrad 1850) by Witter (1879), had not been reported from the Mississippi for many years (Witter 1883). Cummings and Mayer (1992) show the range of *L. subrostrata* as being in the southwestern 2/3 of Illinois, or potentially in at least 14 of 18 counties bordering the Mississippi River.

Witter (1883) stated that *L. subrostrata* was “abundant in Muscatine Slough above Keokuk Lake. It abounds in nearly all ponds near the Mississippi and Cedar”. Mississippi River specimens of *L. subrostrata* (no-dates) are in the Carnegie Museum, Pittsburgh, PA. One male, #61.711, was from Muscatine Slough, Muscatine County, IA. Muscatine Slough was a 17-20 km long side channel that formed one border of Muscatine Island. The upstream end of Muscatine Slough no longer has a direct connection with the Mississippi River main channel because “this slough is closed in the city (Muscatine, IA) by artificial works” (Witter 1879), and because of a levee along the Mississippi River. The downstream end of Muscatine Slough is presently controlled by a pumping station at Mississippi River Mile 442.3.

A female *L. subrostrata* at the Carnegie Museum was from a Mississippi slough in Mercer County, IL (#61.10932). Specimens from Mercer County are also at The Ohio State

University Museum of Biological Diversity (OSUMBD), Columbus, OH (#10278, #10279), Museum of Comparative Zoology, Boston, MA (#37060), and the University of Michigan, Museum of Zoology, Ann Arbor, MI (#89649) (K. Cummings, pers. comm.).

More recent *L. subrostrata* specimens from the Mississippi River, Henderson County, IL, are at OSUMBD. One specimen, collected by the junior author, was from Clear Lake, a Mississippi River backwater. This fairly fresh-dead male was recovered 22 May 1966 [Mississippi River Mile 399.0], DHS:1966:90, #16800. Portions of Clear Lake have since filled with sediment. The second *L. subrostrata* was found 13 April 1968, behind a Pool 19 island at Mississippi River Mile 398.6 (OSUM:1968:0057, #19313), near the mouth of Honey Creek and Shakoken, Henderson County, IL.

Ligumia subrostrata has also been documented from five additional Illinois counties bordering the Mississippi River, all downstream of Rock Island County, IL, (opposite Muscatine County, IA). *L. subrostrata* specimens from Adams, Madison, Randolph, and Union counties are at the Illinois Natural History Survey (INHS), while specimens from Hancock County are at OSUMBD (#46000), and the Indiana State Museum, Indianapolis, IN (#1183).

Although the most recent records of this species from the Mississippi River mainstem was the 1968 Balding Illinois collection, tributary records at INHS from Union (#5607), Adams (#10204), and Madison Counties (#23626) were found 1988, 1990, and 1992 respectively.

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Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel *Sinanodonta woodiana*. 13. News from Austria, the Netherlands, Poland and Ukraine

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During the last four months little additional information has become available concerning the conquest of Europe by the invasive Chinese Pond mussel *Sinanodonta woodiana* (Lea, 1834). Yet several items seem worthwhile to give some more publicity.

Austria

In the past I have referred to the publication by Essl & Rabitsch (2002) concerning the invasive alien species recorded from that Central European country. The original text of that paper was written in German, which made it less accessible to the English speaking public. Since then, an action plan on how to cope with alien species in Austria, written by the same authors in both German and English, has become available in a printed and an electronic form (Essl & Rabitsch, 2004). *Sinanodonta woodiana* is considered by them as a potentially invasive species, but so far the economically problems it may cause, have not been studied enough. The results dealing with aquatic aliens as published by Essl & Rabitsch (2004) have been used for a more popular paper by Erhart (2005) in a newsletter issued by the Association of Fisheries in Tirol.

The Netherlands

It remains a puzzle why the Chinese pond mussel has not been reported so far from the Netherlands. It is readily available in most garden centers where it is being promoted as a biological filter in garden ponds. These mussels are also frequently offered by local aquarists for the same use in aquaria on websites dealing with the sale or exchange of surplus material. Prices range between 1-7 dollars, depending on the size of the mussels. Without doubt such surplus specimens have already been dumped somewhere in aquatic biotopes in the Netherlands, but records of it has not turned up so far.

Poland

Kraszewski (2005) has given some details on the presence of *Sinanodonta woodiana* in the heated Konin Lake. It occurs in the shore zone from 1.5-2.5 m depth, clearly preferring heated habitats of moderate flow. The highest density, up to 60 individuals per square meter and a biomass of up to 20 kg per square meter, was observed in the most heated zones: the

initial cooling reservoir and discharge canals of the power plant.

In 2004, the Institute of Nature Conservation of the Polish Academy of Sciences in Cracow started a three year project titled "Alien invasive species in the fauna of Poland in the context of biodiversity protection" (Stanczykowska et al., 2005). The Chinese Pond mussel is among the nine species included in this project. The results will be published as a synthetic monograph and a series of papers by individual authors.

Mitochondrial DNA-based molecular markers of Polish freshwater bivalves have been studied by Soroka & Grygienczo-Razniewska (2005). *Sinanodonta woodiana* turned out to be very similar to *Anodonta cygnea* (Linnaeus, 1758), but could be differentiated with the help of the AluI enzyme.

Ukraine

Lyashenko et al. 2005 noted the presence of the Chinese Pond mussel among the alien newcomers in aquatic biotopes of the lower reaches of the Danube delta in Ukraine.

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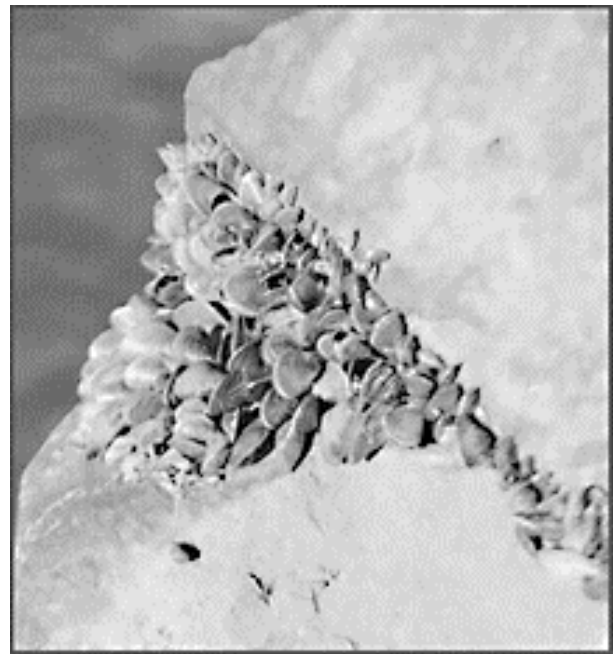
Asiatic Golden Mussel, *Limnoperna fortunei* (Dunker, 1857), in the Uruguay River Basin: a report about the progress heading in direction to the Southwest Brazil region

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The progress of the exotic limnic invader Asiatic Golden Mussel, *Limnoperna fortunei* (Dunker, 1857), into Southwestern Brazilian territory, specifically the Western hidrographical region of Santa Catarina's (SC) State (Agudo 2004 a, b, c, 2005; Agudo & Bleicker 2006), is reported:

February 12-13 2006, a period of regional drought, the occurrence of the species was verified in "high densities" in the country of the Oriental Republic of Uruguay, in the encounter between the secondary rivers Arapey Chico and Arapey Grande, Salto Department (approx. 31°09'S – 57°41'W), occupying riversides composed by dark basaltic rocks, with colonies concentrated on rifts of the close rocky blocks at water levels. This discovery coincides with observations by Brugnoli et al. (2005, pp. 239-240), and confirmed by local researchers Alejandro Otaegui and Valentín Leites (Department of Ecology and Environment, Administrating Commission of Uruguay River, Salto Grande Hydroelectric Reservoir, Uruguay, 13-14/02/2006, pers. comm.). It has been reported in the literature for Salto Grande Dam, North territory of the Uruguay country (Leites & Bellagamba 2002, MS a & b; Leites 2003; Mansur 2003; Mansur et al 2004; Langone 2005).



Limnoperna fortunei in the Arapey River, Uruguay.

The regional fauna of mollusks included the following limnic forms: exotic *Corbicula* spp (relatively abundant), native freshwater mussels of the genus *Anodontites* (living buried in the mud of the riversides) & *Diplodon*, and several gastropods, mainly *Pomacea canaliculata*, as well as one Planorbidae, *Drepanotrema* sp., and a little aquatic snail, *Potamolithus* sp., all previously cited in Uruguay by Scarabino (2004). No terrestrial mollusks were sighted in the inspected area.

Researcher Valentín Leites (14/02/2006, pers. comm.) relayed the information that the Golden Mussel was not confirmed north of Salto Grande Dam in Monte Caseros place (Corrientes Department, Argentina, 30.3°S - 57.7°W) (due to local pollution of the waters?), very close to the Uruguay River section in Rio Grande do Sul (RS) State,

Brazilian territory. Even so, Lisboa (2006) marks the occurrence of this exotic species in the Barra do Quarai or Cuareim river, Uruguay River Basin. Later, researcher Alejandro Otaegui (28/03/2006, pers. comm.) informs of the occurrence of the Asian golden mussel in the town of Belén (30°46'60"S – 57°46'60"W), Salto Department, Uruguay.

Limnoperna fortunei (Dunker, 1857) has had an accelerated migration in the Brazilian territory since it appeared 15 years ago in La Plata River, Argentina (Mansur et al. 2004). Its entrance to Santa Catarina's State (SC) is imminent and inevitable (Agudo 2004b).

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Intermediate host mollusks (Gastropoda: Pulmonata) of parasitic diseases in Santa Catarina's State, Southern Brazil, with inclusion of new records to add to regional inventory

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The State of Santa Catarina (SC) is part of Brazil's southernmost region, situated between the State of Paraná (PR) to the north, and the State of Rio Grande do Sul (RS) along its-southern border; western neighbour is Argentina and along the entire eastern border lies the Atlantic Ocean. Lying between latitudes 25° and 30° S and longitudes 48° and 54° W, SC measures 377 km in the north-south direction, and 547 km east-west at its farthest points, with an area of 95,985 km², including 502 km² of rivers and lakes. The state represents no more than 1.13% of the area of Brazil, geographically divided into two large parts: the Atlantic coastal plains, included to the Itajaí Valley region, and the western Highlands/Plateau. The climate is damp and sub-tropical (average temperature: 17°-21°C), and the vegetation is of the coastal damp forest type (mainly tropical Atlantic woodland) covering 29,622 km². Two river basin systems irrigate the land: the Uruguay and Iguazu rivers form one system, and several basins which discharge into the Atlantic Ocean form the other.

Traditionally, continental malacological fauna in this area of Brazil has been poorly documented, with a few known species cited in historical records. Recent studies (Agudo 2004, 2005, 2006; Agudo & Bleicker 2006) bring the known number of species to 126: 102 GASTROPODA – 11 Prosobranchia & 91 Pulmonata, and 24 BIVALVIA – 17 Unionoida & 7 Veneroida, distributed in 73 genera, 35 families, and 2 classes; including four new records of native

species, based on field research and literature contributions (Thomé 1975; Perizzolo 2003):

Systematic Species List – new records

Class BIVALVIA

Order Veneroida

Family SPHAERIIDAE Deshayes, 1854

Pisidium pipoense (Ituarte, 2000)*, **

Pisidium taraguyense (Ituarte, 2000)*, **

Class GASTROPODA

Subclass Pulmonata

Family SUCCINEIDAE Beck, 1837

Succinea meridionalis d'Orbigny, 1846*

Family VERONICELLIDAE Gray, 1840

Vaginulus taunayi Férussac, 1821*

*New occurrence of Genus

**Specific determination based in Ituarte (2000)

Seeking select development of dissertation thesis in the branch of the regional Medical Geography (Agudo-Padrón 2006), a general study on the biogeographical incidence and potential of the occurrence and/or of territorial expansion of diseases specifically transmissible for vectorial limnic and terrestrial mollusks present in the Santa Catarina (SC) State territory was driven, being obtained as result the confirmation of 3 tropical zoonoses of parasitic nature (helminthoses/verminoses) with immediate medical-sanitarium and veterinarian interest; among 12 species of vectorial pulmonate gastropod mollusks and the human & cattle flocks, whose regional geographical-space distribution was mapped previously by us between 1996 and 2006:

- 1) Esquistossomose, disease transmitted by the aquatic parasitic worm *Schistosoma mansoni* Sambon, 1907 (PLATYHELMINTHES; TREMATODA), with 3 native freshwater snail species of the family Planorbidae confirmed as intermediate hosts in the State: *Biomphalaria glabrata* (Say, 1818), *B. straminea* (Dunker, 1848) & *B. tenagophila* (d'Orbigny, 1835) (one other native Planorbid species, *Drepanotrema cimex* (Moricand, 1839), being found naturally infected by other 2 trematode larvae forms - furcocercaria, without interest in the epidemiology of Esquistossomose), and principal space registrations limited to 3 Municipal districts of the North area: “São Francisco do Sul”, “Guaramirim” and “Jaraguá do Sul”, as well as along the entire eastern Atlantic coastal plains;
- 2) Angiostrongilíase abdominal, disease transmitted by the terrestrial parasitic worm *Angiostrongylus* (*Parastrongylus*) *costaricensis* Morera & Céspedes, 1971 (ASCHELMINTHES; NEMATODA), with 7 land species involved as confirmed intermediate hosts in the State: 1 exotic snail (*Bradybaena similaris* Férussac, 1821), 3 native slug-sandpaper (*Belocaulis angustipes* (Heynemann, 1885), *Phyllocaulis variegatus* (Semper, 1885), *Sarasinula linguaeformis* (Semper, 1885)) and 3 exotic semi-slugs (*Deroceras laeve* (Müller, 1774), *Limax flavus* Linnaeus, 1758, *Limax maximus* (Linnaeus, 1758)),

and space registrations limited to the Municipal districts of “Nova Itaberaba” and “São Lourenço d'Oeste”, in the West rural area, being parallel and totally discarded, under technical argument, the participation of the African giant-snail *Achatina* (*Lisoachatina*) *fulica* (Bowdich, 1822) as effective spontaneous and natural intermediate host of that disease (SC and Brazil in general); and ...

- 3) Fasciolose or Fasciolíase (disease of Veterinary interest in sheep and bovine cattle, mainly), transmitted by the aquatic parasitic worm *Fasciola hepatica* (Linnaeus, 1758) (PLATYHELMINTHES; TREMATODA), with 2 freshwater snail species of the family Lymnaeidae involved as confirmed intermediate hosts in the State: *Lymnaea* (= *Pseudosuccinea*) *columella* Say, 1817 & *Lymnaea viatrix* d'Orbigny, 1835, and space registrations limited along to the entire eastern Atlantic coastal plains and a “seemingly isolated” nucleus in the south Plateau, Municipal district of “Urubici”.

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Aquatic snails intercepted by inspectors of the plant protection and inspection services at Ben-Gurion Airport, Israel

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Inspectors of the Plant Protection and Inspection Services, Ministry of Agriculture and Rural Development of Israel, are systematically checking commercial, agricultural and horticultural shipments arriving from abroad at Ben-Gurion Airport and, to a lesser degree the luggage of passengers, for the presence of pest species. Since 1980 I have been receiving the molluscs from the intercepted material for identification and permanent storage in one of the two National Mollusc Collections (Hebrew University of Jerusalem or Tel Aviv University). Most of the material consisted of terrestrial species, only occasionally were aquatic molluscs involved.

So far only ten samples of freshwater molluscs were submitted for identification (Table 1). The first four samples were encountered on aquatic plants imported for the aquarium trade (Katsir, 1979; Mienis, 1994), the next sample was found among water lilies destined for garden centers, and the five most recent interceptions consisted of large numbers of snails found in the luggage of temporary laborers arriving from Thailand (Kedmi & Moran, 2005a-b; Mienis, 2006). They tried to smuggle these snails into Israel with the intention to grow them for food.

Table 1. Samples of aquatic snails intercepted at Ben-Gurion airport, Israel, by inspectors of the Plant Protection & Inspection Services.

Species	Origin	Date	Identification
<i>Digoniostoma truncatum</i> <i>Radix viridis</i> <i>Gyraulus convexiusculus</i> <i>Ameriana carinata</i>	Aquarium plants from Singapore and Hong Kong	In or before 1979	L. Forcart
<i>Haitia acuta</i>	On <i>Echinodorus</i> , country of origin unknown	10.09.1985	H.K. Mienis
<i>Haitia acuta</i>	On <i>Azolla caroliniana</i> from England	14.09.1989	H.K. Mienis
<i>Pseudosuccinea columella</i>	On <i>Anabius</i> , country of origin unknown	1996	H.K. Mienis
<i>Planorbis planorbis planorbis</i> <i>Planorbarius corneus</i>	On <i>Nymphaea</i> from Germany	01.05.2002	H.K. Mienis
<i>Filopaludina martensi martensi</i>	As food from Thailand	17.03.2005	H.K. Mienis
<i>Filopaludina martensi martensi</i>	As food from Thailand	16.11.2005	H.K. Mienis
<i>Filopaludina martensi cambodjensis</i> <i>Pomacea canaliculata</i> <i>Pomacea insularum</i>	As food from Thailand	02.01.2006	H.K. Mienis
<i>Filopaludina martensi martensi</i> <i>Pila ampullacea</i>	As food from Thailand	09.04.2006	H.K. Mienis
<i>Filopaludina martensi martensi</i> <i>Pila ampullacea</i>	As food from Thailand	20.04.2006	H.K. Mienis

Thirteen different taxa could be recognized (Table 2). Some of them were already known from Israel. For example, *Haitia acuta*, a North American species, is in fact the most common aquatic snail in Israel; likewise *Pseudosuccinea columella*, also from North America, is rapidly spreading in stagnant or slow flowing water; *Radix viridis*, a Southeast Asian species, has been found in a hothouse, and both species of *Pomacea*, originally from South America, are commonly kept in aquaria and here and there in large ponds.

The interceptions of large amounts of the two subspecies of *Filopaludina martensi*, up to 200 snails per batch, form a rather worrying situation (Mienis, 2006). Not only are they well known intermediate hosts of intestinal flukes (*Echinostoma*), but a recent trial carried out by the author has shown that, under natural conditions prevailing in Israel, they can build up large populations within a very short time. When released in the few aquatic biotopes which are still suitable for mollusc life in Israel, they may out-class the last living autochthonous species.

Table 2. Systematic list of intercepted aquatic snails at Ben-Gurion Airport, Israel.

Family Viviparidae

Filopaludina martensi cambodjensis (Mabille & Le Mesle, 1869)

Filopaludina martensi martensi (von Frauenfeld, 1865)

Family Ampullariidae

Pila ampullacea (Linnaeus, 1758)

Pomacea canaliculata (Lamarck, 1819)

Pomacea insularum (d'Orbigny, 1839)

Family Bithyniidae

Digoniostoma truncatum (Eydoux & Souleyet, 1852)

Family Lymnaeidae

Pseudosuccinea columella (Say, 1817)

Radix viridis (Quoy & Gaimard, 1832)

Family Physidae

Haitia acuta (Draparnaud, 1805)

Family Planorbidae

Ameriana carinata (H. Adams, 1861)

Gyraulus convexiusculus (Hutton, 1849)

Planorbis planorbis (Linnaeus, 1758)

Planorbarius corneus (Linnaeus, 1758)



Filopaludina martensi martensi

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FMCS 2005 Freshwater Mollusk Bibliography

Compiled by Kevin S. Cummings
Illinois Natural History Survey, Champaign, Illinois

This bibliography lists freshwater mollusk papers that have been published up to and including 2005 and that have not appeared in previous FMCS bibliographies. Citations are split into five groups: Unionoida, Sphaeriidae, Corbiculidae, Dreissenidae & Other Bivalves, and Gastropoda. Papers that list taxa from more than one category are included in each group. A searchable database of over 15,700 references on freshwater mollusks is available on the web at <http://ellipse.inhs.uiuc.edu:591/mollusk/>

To insure that papers are cited correctly, researchers are encouraged to send pdf's or reprints to: Kevin S. Cummings, Illinois Natural History Survey, 1816 S. Oak Street, Champaign, Illinois 61820 or ksc@inhs.uiuc.edu

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Dates to Remember

Abstracts must be received by December 1, 2006

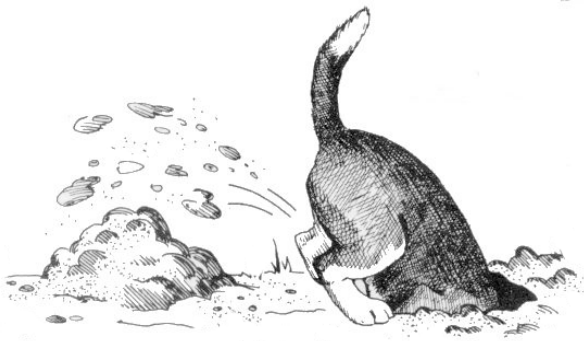
Student Travel Award applications are due December 15, 2006

Nominations for FMCS Professional Awards are due December 31, 2006

Early symposium registration ends February 1, 2007

*Book your room at the Peabody Little Rock by February 9, 2007 – why not do it today?
Call 501-906-4000 and use the meeting code FMCS2007*

Helpful Hints from Hoppy:



**Hoppy Says — Don't be a bankwalker
or a wallflower...get involved!**

Submitted by Steve Ahlstedt

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If you are interested in joining a committee, please contact one of the appropriate chairs.

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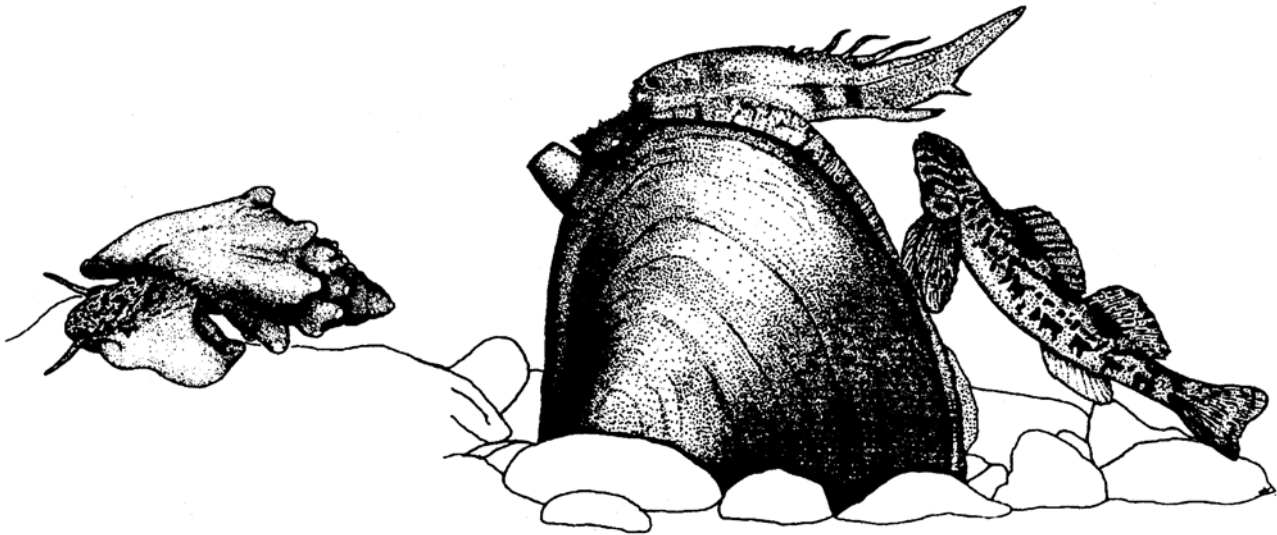
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Freshwater Mollusk Conservation Society



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