

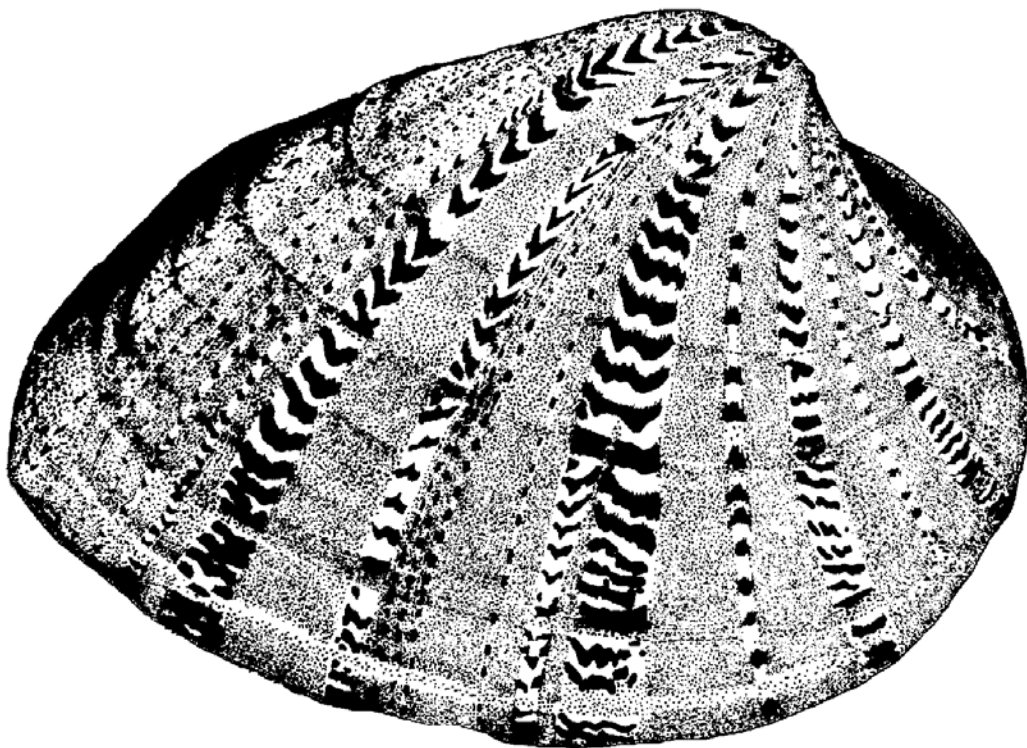
# *Ellipsaria*

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The Newsletter of the Freshwater Mollusk Conservation Society

Volume 7 - Number 1

April 2005



*In this issue:*

Officer Elections  
2005 Symposium News  
Call for Auction Items

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Submissions for the August 2005 issue of *Ellipsaria* may be sent in at any time but are due by July 15, 2005. Anyone may submit an article but you must be a member of FMCS to receive *Ellipsaria*. 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; please send submissions to the editor.

Submissions to *Ellipsaria* are not peer reviewed, but are checked for content and general editing.

Please send change of address information to the Secretary, Rita Villella.

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# Ellipsaria

NEWSLETTER OF THE FRESHWATER MOLLUSK CONSERVATION SOCIETY

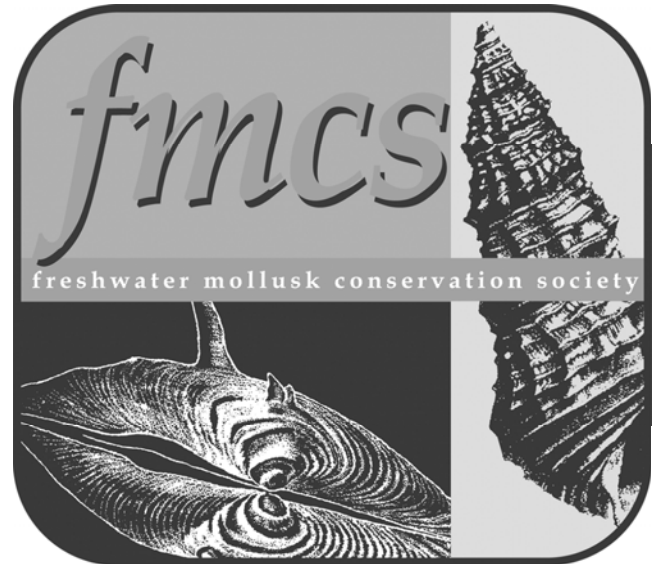
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<http://ellipse.inhs.uiuc.edu/FMCS/>

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**REALLY COOL RAFFLE PLANNED FOR SYMPOSIUM!**  
***Hoppy says "Everyone's a Winner"***

*That's right! We're gonna do it again in St. Paul by bringing you an enjoyable night of painless fundraising to support student travel at the FMCS Auction/Raffle. We raised over \$3500 in Raleigh on a very nice variety of items, including some great contributions from members. This year we'll do a combination bucket raffle/silent auction/live bidding war so come prepared to give 'til it hurts!*

*We need your support this year! ALL SOCIETY MEMBERS are asked to contribute one or more items to the cause. Think about what type of things you enjoy – ART, BOOKS, HOBBY EQUIPMENT, DIVE GEAR, MUSIC, ETC. – then swallow your pride and ask a local merchant to donate it. Bring it with you and help FMCS bolster its ranks with new blood. Please contact Kurt Welke ([kurt.welke@dnr.state.wi.us](mailto:kurt.welke@dnr.state.wi.us)) to coordinate the donations.*

*Thanks!!!*

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## FMCS Reports

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### FMCS 2005 Symposium May 15 - 18, 2005 Radisson Riverfront Hotel St. Paul, Minnesota, USA

#### *Are Your Natives Restless? Holistic Strategies for Conserving Freshwater Mollusks during Exotic Species Invasions*

This is a gentle reminder to register for the 2005 Freshwater Mollusk Conservation Society, May 15-18, 2005. Early registration ended March 27<sup>th</sup>; but you can still get a pre-registration discount (\$180) if you register by April 28<sup>th</sup> (forms must be received by May 5<sup>th</sup>). You can also register on-site for \$210. I urge everyone to attend. Visit the Symposium website for details and a registration form: <http://ellipse.inhs.uiuc.edu/FMCS/symposium/>

Also, please book your rooms at the Radisson by April 15<sup>th</sup>. Please try to use this hotel so that we can make our quota of rooms. The FMCS room rate is \$105 plus tax; call 651-292-1900 for reservations and tell them you are with FMCS.

If you have items for the auction (rarities, weird science stuff, you name it) please contact Kurt Welke at: [Kurt.Welke@dnr.state.wi.us](mailto:Kurt.Welke@dnr.state.wi.us)  
*G. Thomas Watters, FMCS President*

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### Symposium Field Trips

**Lake Pepin:** mussel propagation cage site visit (65 miles by car to beach site).

Join a carpool journey to the sandy shores of beautiful Lake Pepin, a natural riverine Mississippi lake, where we will visit the *Lampsilis higginsii* cage propagation site at Frontenac, MN. Since 2000, the Mussel Conservation Team has been using this site to place fish inoculated with glochidia into wire-mesh cages with solid bottoms. After about 30 days the fish are released and the excysted *L. higginsii* are left to grow in the bottom of the cages protected from predators. On this trip we will retrieve a couple of cages that were placed in the lake in 2003 and 2004 to see how our "babies" are doing.

**St. Croix River:** snorkeling in winged mapleleaf country (45 miles by car & boat)

We will carpool to Franconia, MN on the Wild and Scenic St. Croix River. If you snorkel, bring a wetsuit, it'll still be chilly. Otherwise be prepared to wade in the shallow riffle areas where you might catch a glimpse of some of the Upper Midwest's rarest mussel species. This is home to the Federally Endangered *Quadrula fragosa*, *Lampsilis higginsii* and more than a dozen other state listed species. In the St. Croix River basin we have the last remaining viable populations in Minnesota of *Epioblasma triquetra*, *Cumberlandia monodonta*,

*Cyclonaias tuberculata*, *Tritogonia verrucosa*, *Simpsonaias ambigua*, *Quadrula metanevra*, and *Ellipsaria lineolata*.

**Mississippi River Gorge:** mussel reintroduction site (5 miles by car, boat tour of site).

Carpool or take a short taxi ride to Hidden Falls Park on the bank of the Mississippi River. This hidden treasure is in the heart of Minnesota's largest metropolitan area, yet when you are there it feels almost like a wilderness. One of last ice ages' finest remnants, the gorge of the Mississippi River was formed by the upstream migration of the famous Falls of St. Anthony. By the late 1800's the falls had moved about 7-miles upstream of the Mississippi's confluence with the Minnesota River and in its wake had left the steepest rapids found anywhere on our continents largest river, nearly 100 feet of gradient. Unfortunately for the fish and mussels of the free-flowing Mississippi, a dam was completed in 1917 that drowned all but a small remnant of the former rapids, blocking access to spawning sturgeon, paddlefish and other species. Today, below the dam there are still a couple of miles of fast moving water with stable gravel and cobble bottom. With relief from extreme water quality problems present prior to 1990, a rebirth of life in this former (and original) "dead zone" of the Mississippi River has been taking place. In 2000 an effort to reintroduce *Lampsilis higginsii* and several other rare species began. We'll tour this site by boat and explore the natural beauty of the Mississippi's only gorge by locking up through the 40 foot high dam and traveling to the foot of St. Anthony Falls (weather permitting).

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### FMCS Officer Elections

It's time to elect a new President and Secretary. A ballot has been included with this newsletter. The new President will serve for 6 years – President-Elect (2 yrs), President (2 yrs), Past President (2 yrs) – beginning in May 2005. The new Secretary will serve 2 years beginning in May 2005. Please take a few minutes to read the position statements printed below, and then return your marked ballot to Leroy Koch by **May 5, 2005**.

#### **-Candidate for President- Position Statement**

**Steven Ahlstedt  
U. S. Geological Survey  
Knoxville, Tennessee (retired)**

As one of the founding member of the Freshwater Mollusk Conservation Society and Chair of the Commercial Mussel Committee (currently under Guidelines and Techniques), I would be honored to be it's next president. I am currently retired from the USGS and feel as though I can devote more time to the needs of our society unhindered as a full-time government employee. I understand that I may be running unopposed which is a concern since the vitality of our society depends on commitment and participation that often

conflicts with biologists that are currently covered up with their own projects.

I graduated from high school (1964) in Jamestown, New York was drafted four days after turning 19 into the Army then joined the Air Force (1965-1969). I was attending night school at Jamestown Community College and working full-time so I didn't have enough credit hours for a student deferment. Such was my greetings from Uncle Sam. My military duty was intelligence and most of the time I was stationed in remote or isolated locations. Luckily, one place was Johnston Atoll in the South Pacific that opened my eyes to the wonderful world of marine mollusks. After a one-year tour at another remote location across the big pond (VN) and completion of military service, I started back to college in fall 1969. I had envisioned being a marine biologist and participated in a marine survey of San Salvador Island, Bahamas before the Bahamas gained independence from Great Britain. I also had participated in a joint US-Canadian study of Seneca Lake and the fauna that lives in freshwater. I graduated in 1973 from Alfred University, Alfred, New York with a BA in Biology-Geology with a minor in Environmental Studies. After a year of job hunting and working nights in a factory, I was finally hired in 1974 as a fisheries technician by the NY Department of Environment and Conservation, Olean, New York. My employment there was not secure since New York had a riff (reduction-in-force) and I was again unemployed. As fate would have it, I received a phone call from the Tennessee Valley Authority and was offered a job as a fisheries technician two days after I was riffed. Was I fortunate or what! My wife and I moved to Tennessee in October 1974. I never realized that the Southeastern United States was the center for mollusk biodiversity and that many were located practically in my back yard. My fate was sealed...studying freshwater mussels for the next 30 years (20 at TVA and 10 at the USGS). Also during this time, TVA allowed me to work part-time on a MS degree at the University of Tennessee that they paid for. I was grateful for that and I graduated in 1984 with a MS in Wildlife and Fisheries Science.

I have been extremely fortunate over the last 30 years to have known and worked with so many exceptional biologists/malacologists. I now realize that most mollusk species are in serious declines across the nation and this fauna will only survive when they are recognized as the best indicators of good water quality. The fate of our mollusk fauna rests in the hands of state and federal resource managers responsible for its protection. Enforcement of existing water quality regulations is critical for the survival of this resource.

I think our society has done an exceptional job in a very short period of time getting information out to the public in the form of symposia, workshops, newsletters, and publications. As president, I would like to invite other groups into our society, especially the numerous watershed conservation groups scattered across the country. Since we all basically share the same goals, this would be a logical step that would also increase membership in our society. Perhaps a symposium that is directed at watershed groups

and fauna recovery in those watersheds is in order. Further, we have to find out who our lobbyists are for securing our share of the funding needed to conserve this resource, and make sure that upper level managers responsible for this resource are personally invited to attend along with the news media. Let's all work together on this!

## **-Candidates for Secretary- Position Statements**

### **Patricia Morrison USFWS - Ohio River Islands NWR Parkersburg, WV**

For those of you who do not know me, I am a fish and wildlife biologist with the USFWS, stationed along the Ohio River in Parkersburg, WV, where my job includes inventorying and monitoring freshwater mollusks on the refuge (and beyond). I received my B.S. in Biology from M.I.T., with an emphasis on community ecology, and later a Law Degree from the WVU-College of Law. My work with the FWS began in Massachusetts in 1978, then to Elkins, WV, and now the Ohio River Islands National Wildlife Refuge is my home.

Although I get to work with all aspects of biology on the refuge (birds, plants, insects, mammals, amphibians, etc.), mussels are my passion. I am privileged to have been a part of the Ohio River Valley Ecosystem Team (as a member and later as its leader) and its very active Mollusk Subgroup since 1995 (two years as its leader). From my experiences, "mussel people" are the most fun, unusual, unselfish, and creative people I get to work with. It's because of you that there is an FMCS, and I'm glad to be a part of it. I've served on the Water Quality, Habitat and Zebra Mussel Committee and Techniques and Guidelines Committee, and am currently the co-chair (with Dick Biggins) of the Environmental Quality and Affairs Committee. I remain committed to the goals of the Society and would work diligently in my role as Secretary.

### **Jess Jones Virginia Tech Blacksburg, VA**

I am a US Fish and Wildlife Biologist currently working on various freshwater mussel restoration projects in the upper Tennessee River watershed. I have been involved with the FMCS for a number of years, serving as the Chair of the Propagation and Restoration sub-committee. The FMCS is one of the most active aquatic conservation groups in the country, and serving as an officer allows one to directly contribute back to the society. Therefore, I would like to continue working as an FMCS officer, so I am asking you for your vote! If elected Secretary, the society is sure to get one of the slowest typists around (about 10-20 words a minute), but I am organized and know how to get all the important business down the old fashioned way using pen and paper. So, FMCS members and dedicated readers of *Ellipsaria*, feel confident that you will be electing an able bodied fellow member who will dutifully record and report

to you on all of the latest scintillating mollusk news and society updates. Please vote and help spread the fruits of malacology around the world!  
Sincerely and with kind regards,  
Jess Jones

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## ***News & Announcements***

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### **News from the Malacology Collection of the Cincinnati Museum of Natural History and Science**

Formerly the Western Academy of Science and the Cincinnati Society of Natural History, the Cincinnati Museum of Natural History and Science (CMNHS) is part of Cincinnati Museum Center (CMC), and has included a collection of mollusks since at least 1876. Cincinnati was an important center of malacological activity in Ohio and the Midwestern USA during the late XIX century, and a number of notable early American malacologists had various types of association with the collection and with malacology in the region. Substantial activity continued thru much of the XX century, but declined due to the absence of permanent staff.

In 2001, The Malacology Collection was moved to the Geier Research and Collections Center, a modern facility where CMC maintains its major collections and research laboratories. The collection includes freshwater, terrestrial, and marine mollusks of worldwide distribution, mainly from the Classes Bivalvia and Gastropoda. Dry specimens are held in 45 cabinets (~800 drawers). A conservative working estimate places the total number of lots in the tens of thousands. In addition, large amounts of material remain in unsorted boxes. Of particular value and extent are holdings of freshwater mussels and gastropods from the Midwest and other US regions, as well as freshwater and terrestrial mollusks from the Americas, Africa, and Asia. Several type specimens are held in the collection, and more are likely to be found. Most of the collection has not been curated and remains un-cataloged, or cataloged in manners not amenable to modern systematic research.

Since 2003 we have been working on revitalizing the mollusk collection, and adopted a unified, modern cataloguing system. We began working with the non-marine mollusks, and have made important progress with US freshwater mussels, and freshwater and terrestrial mollusks from South America. In addition, recent specimen collections have been made as part of currently funded field research projects, and personal interests of staff members. An additional large and valuable collection of freshwater mussels from the Midwest was recently accessioned. CMC would like to encourage the use of its collections for scientific or educational purposes through visits, temporary loans or other means. The beginning of our electronic database will soon be available at

<http://wwwf.countryday.net/FacStf/us/borrerof/>  
Contact information for the Malacology Collection:  
Cincinnati Museum Center at Union Terminal  
1301 Western Avenue, Cincinnati, OH 45203

Dr. Stephen Matter, Curator of Zoology,  
[smatter@cincymuseum.org](mailto:smatter@cincymuseum.org), (513) 455-7163  
Dr. Francisco J. Borrero, Research Associate &  
Adjunct Curator of Mollusks,  
[borrerof@countryday.net](mailto:borrerof@countryday.net), (513) 368-6515

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### **Unionid News from the Milwaukee Public Museum**

The Milwaukee Public Museum (MPM) has posted a Mathiak Collection database on our museum website at <http://www.mpm.edu/collect/invert/mussels/default.asp>

Harold A. Mathiak surveyed 251 rivers and creeks across Wisconsin for the presence of freshwater mussels during the summers of 1973 through 1977 and published the results of the 641-site survey in his 1979 book, now out of print. Voucher specimens (7000+) with pertinent date, stream, county, and township/range/section data were donated to 6 institutions including MPM.

This website offers a searchable, composite database of the Mathiak Collection and includes mussel images and maps from his book *A River Survey of the Unionid Mussels of Wisconsin 1973-1977*, as provided through the generous permission of Jean Walker and Lucy Mathiak, daughters of the author. Database searching can be done using Genus, Specific, and County fields. Among the variables given for each lot is the institution where it is now stored, including The Ohio State Museum of Biological Diversity, the University of Tennessee Frank McClung Museum, the University of Wisconsin Zoological Museum and University of Wisconsin Waukesha Field Station.

Initial support for website posting of MPM Invertebrate Zoology databases was received from a Wisconsin DNR Aquatic & Terrestrial Resources Inventory grant. Zoologists at the institutions cited above cooperated in the creation of this Mathiak Collection database, which was posted in January 2005 by MPM webmaster Ian Edwards. In the hope that this site can be expanded and improved in the future, your comments and input are welcomed.

Wisconsin unionids are among the most significant holdings of the MPM Mollusk Collection, which in addition to the Mathiak material includes mussel specimens collected in the state nearly a century ago. A small Wisconsin display, created to accompany the appearance of the traveling exhibit "Pearls: A Natural History" at MPM (05 March - 26 June 2005), features film footage taken of Mississippi River commercial clammers at work near Lynxville, Wisconsin, in 1925 (cf Historic Film Re-Discovered, *Ellipsaria* 5(3):11). This display of items from the state's pearl button industry is complemented by an aquarium filled with living freshwater

mussels, made available through the generosity of Roger Gordon of the U.S. Fish & Wildlife Service, and Lisie Kitchel and Kurt Welke of the Wisconsin DNR.

Submitted by Joan Jass, Milwaukee Public Museum, [jass@mpm.edu](mailto:jass@mpm.edu)

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## AMS and WSM Joint Meeting June 26-30 2005

The 71st Annual Meeting of the American Malacological Society will be held jointly with the 38<sup>th</sup> Annual Meeting of the Western Society of Malacologists at the Asilomar Conference Grounds in Pacific Grove, California, on the beautiful Monterey Peninsula. The meeting will begin at dinner on June 26<sup>th</sup>, followed by a welcoming social, and end at lunch on the 30<sup>th</sup>. An exciting scientific program is planned with three symposia, one sponsored by each society and one joint sponsored symposium. We look forward to many exciting contributed papers and posters to compliment these symposia. <http://zeus.calacademy.org/WSM>

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## 2005 Freshwater Mussels of the Pacific Northwest Symposium

The Pacific Northwest Native Freshwater Mussel Workgroup is hosting the 3<sup>rd</sup> Annual "Freshwater Mussels of the Pacific Northwest" Symposium. The Symposium will take place in Olympia, WA on June 15, 2005. Lee Hastie of the University of Aberdeen will give the keynote address on "Mussel Conservation: a European Perspective". The remaining portion of the Symposium will be divided among 3 workshops. Mark Hove of the University of Minnesota will address "Mussel Techniques", including aging, preservation, identification, and genetic sampling. David Smith, U. S. Geological Survey, will teach a short session on "Design and Methods for Sampling". Jeanette Howard, of the Confederated Tribes of the Umatilla Indian reservation, will team up with Kurt Welke, Wisconsin Department of Natural Resources, to discuss the "Functional Role of Mussels and Opportunities for Public Outreach". Lastly, regional biologists will communicate the results of ongoing local research through a poster session. Admission is free, but limited to the first 90 registrants. Please register online at <http://columbiariver.fws.gov/musselwg.htm>

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## History of Malacology, Second Addition

The American Malacological Society has posted the Second Edition of *2,400 Years of Malacology* by Eugene V. Coan, Alan R. Kabat, and Richard E. Petit on their website: [http://erato.acnatsci.org/ams/publications/2400\\_malacology.html](http://erato.acnatsci.org/ams/publications/2400_malacology.html) This is a comprehensive catalog of biographical and bibliographical papers on malacologists, conchologists, paleontologists, and others with an interest in mollusks. Since the first edition was posted in June 2004, we have received comments and additions from a number of colleagues—for which we are most grateful—and have

continued our own searching through the extensive literature. This catalog is a work in progress, and updated versions will be posted periodically.

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## Publications

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### Genetic Diversity and Divergence Among Freshwater Mussel (*Anodonta*) Populations in the Bonneville Basin of Utah

K.E. Mock\*, J.C. Brim-Box\*†, M.P. Miller\*, M.E. Downing‡, and W.R. Hoeh‡

\*Department of Forest, Range, and Wildlife Sciences, Utah State University, 5230 Old Main Hill, Logan, UT 84322–5230, USA,

† USDA Forest Service, Logan, Utah, USA,

‡ Department of Biological Sciences, Kent State University, Kent, Ohio, USA.

### Molecular Ecology (2004) 13, 1085–1098.

#### Abstract

Populations of the freshwater mussel genus *Anodonta* appear to be in a state of rapid decline in western North America, following a trend that unfortunately seems to be prevalent among these animals (Mollusca: Unionoida). Here we describe the patterns of molecular divergence and diversity among *Anodonta* populations in the Bonneville Basin, a large sub-basin of the Great Basin in western North America. Using amplified fragment length polymorphism (AFLP) analysis, we found a striking lack of nuclear diversity within some of these populations, along with a high degree of structuring among populations ( $F_{ST} = 0.61$ ), suggesting post-Pleistocene isolation, due either to a long-term loss of hydrologic connectivity among populations or to more recent fish introductions. We also found evidence of recent hybridization in one of these populations, possibly mediated by fishstocking practices. Using mitochondrial sequence data, we compared the Bonneville Basin populations to *Anodonta* in several other drainages in western North America. We found a general lack of resolution in these phylogenetic reconstructions, although there was a tendency for the Bonneville Basin *Anodonta* (tentatively *A. californiensis*) to cluster with *A. oregonensis* from the adjacent Lahontan Basin in Nevada. We recommend further investigation of anthropogenic factors that may be contributing to the decline of western *Anodonta* and a broad-scale analysis and synthesis of genetic and morphological variation among *Anodonta* in western North America.

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## Freshwater Mussel Shells as Environmental Chronicles: Geochemical and Taphonomic Signatures of Mercury-Related Extirpations in the North Fork Holston River, Virginia

Megan E. Brown\* Michal Kowalewski, Richard J. Neves, Donald S. Cherry, and Madeline E. Schreiber

Department of Geosciences, U.S. Geological Survey, Department of Fisheries and Wildlife Sciences, and Department of Biology, Virginia Tech, Blacksburg, Virginia 24061

**Environ. Sci. Technol.** (2005) 39(6), 1455 -1462.

### Abstract

This study utilized freshwater mussel shells to assess mercury (Hg) contamination in the North Fork Holston River that extirpated (caused local extinctions of) a diverse mussel fauna. Shells ( $n = 366$ ) were collected from five sites situated upstream (two sites), just below (one site), and downstream (two sites) of the town of Saltville, Virginia, where Hg was used to produce chlorine and caustic soda from 1950 to 1972. Shell samples were used to test the (1) utility of geochemical signatures of shells for assessing the spatial variation in Hg levels in the river relative to the contamination source and (2) value of taphonomy (post-mortem shell alteration) for distinguishing sites that differ in extirpation histories. Geochemical signatures of 40 shells, analyzed using atomic absorption spectroscopy, indicated a strong longitudinal pattern. All shells from the two upstream sites had low Hg concentrations ( $<5\text{-}31$  g/kg), shells directly below Saltville had variable, but dramatically higher concentrations ( $23\text{-}4637$  g/kg), and shells from the two downstream sites displayed intermediate Hg levels ( $<5\text{-}115$  g/kg) that declined with distance from Saltville. Two pre-industrial shells, collected at Saltville in 1917, yielded very low Hg estimates ( $5\text{-}6$  g/kg). Hg signatures were consistent among mussel species, suggesting that Hg concentrations were invariant to species type; most likely, highly variable Hg levels, both across sites and through time, overwhelmed any interspecific differences in Hg acquisition. Also, a notable post-mortem incorporation of Hg in mussel shells seemed unlikely, as the Hg content was not correlated with shell taphonomy ( $r = 0.18$ ;  $p = 0.28$ ). The taphonomic analysis ( $n = 366$ ) showed that the degree of shell alteration reliably distinguished sites with different extirpation histories. At Saltville, where live mussels have been absent for at least 30 years, shells were most heavily altered and fragmented. Conversely, fresh-looking shells abounded upstream, where reproducing mussel populations are still present. In summary, relic shells offered valuable spatio-temporal data on Hg concentrations in a polluted ecosystem, and shell taphonomic signatures discriminated sites with different extirpation histories. The shell-based strategies exemplified here do not require sampling live specimens

and may augment more standard strategies applied to environmental monitoring. The approach should prove especially useful in areas with unknown extirpation and pollution histories.

Full article: <http://pubs.acs.org/journals/esthag/>

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## Strong Effects of Predation by Fishes on an Invasive Macroinvertebrate in a Large Floodplain River

Michelle R. Bartsch, Lynn A. Bartsch, and Steve Gutreuter  
US Geological Survey, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, Wisconsin 54603 USA

**Journal of the North American Benthological Society** (2005) Vol. 24, No. 1, pp. 168–177.

### Abstract

We assessed the effects of fish predation on zebra mussels (*Dreissena polymorpha*) in Navigation Pool 8 of the Upper Mississippi River from 13 May to 5 October, 1998. Concrete-block samplers were deployed at 18 randomly chosen sites in the main-channel border, with 6 sites in the upper, middle, and lower segments of the pool. Two blocks, 1 of which was enclosed in a cage to exclude large predatory fishes, were deployed at each site. After 145 d, blocks were retrieved from 12 of the 18 sites, and zebra mussels were found on all blocks. Densities of zebra mussels were higher on caged blocks than uncaged blocks, and the magnitudes of the differences varied spatially. Mean mussel densities on uncaged blocks were reduced by 66%, 86%, and 20% compared to caged blocks in the upper, middle, and lower pool segments, respectively, over the 145-d interval. Mean daily instantaneous zebra mussel mortality rates from large predators ranged from 0.0016 to 0.0138. Similarly, biomass of zebra mussels was higher on caged than uncaged blocks. Mean mussel biomass on uncaged blocks was reduced by 64% pool-wide, relative to biomass on caged blocks. Zebra mussels were consumed by at least 6 fish taxa including redhorse suckers (*Moxostoma* spp.), common carp (*Cyprinus carpio*), bluegill (*Lepomis macrochirus*), quillback carpsucker (*Carpiodes cyprinus*), flathead catfish (*Pylodictis olivaris*), and freshwater drum (*Aplodinotus grunniens*). Fish predation had an important moderating effect on zebra mussel demography in Pool 8.

For a PDF of this reprint please contact Michelle Bartsch at [mbartsch@usgs.gov](mailto:mbartsch@usgs.gov)

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## Contributed Articles

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### A Prehistoric Record of the Pond Mussel (*Unio tetrasmus*) from the Tennessee River, Hardin County, Tennessee

Paul W. Parmalee  
Frank H. McClung Museum  
University of Tennessee, Knoxville

The Pond Mussel, *Unio tetrasmus* (Say, 1830), is a widely distributed species throughout much of the central and lower Mississippi River drainages, occurring west to Colorado, Oklahoma, and Texas (Parmalee and Bogan, 1998). It is a fairly common mussel in all drainages in West Tennessee, becoming quite abundant in shallow river embayments, sloughs and water filled barrow pits. A stable substrate composed of clay and/or compacted sand and mud appears to provide the most suitable habitat for this species.

The Shiloh Site (40HR7), a prehistoric village and mound complex comprising some 40 acres, is located along the west bank of the Tennessee River at Tennessee River Mile (TRM) 198.4, Hardin County, TN. Judging from the analyses of ceramics recovered at the site, Shiloh is considered to be an early Mississippian mound center, probably dating from ca. A.D. 1050 to 1350 (Finger, 2004). Apparently the earliest archaeological investigations (1899) involved one of the 70 to 80 small house mounds comprising the site. Archaeologist David Anderson (Finger, 1004:33) noted that "A far more extensive series of excavations [by the Civilian Conservation Corps] was conducted across the site in 1933 and 1934." After impoundment of the lower Tennessee River as a result of construction of Kentucky Dam (1944), the largest mound (Mound A) situated on the bluff edge began eroding into the river prior to and during the 1980s. Archaeological salvage operations were initiated in 1999 and were continued periodically during the following summers through 2004. Although the quantity of aquatic mollusks recovered was not great, the diversity of species represented suggest the presence of a former extensive shoal adjacent to the site. A total of 724 shells (5 species) of aquatic gastropods and 1,112 identifiable freshwater mussel valves (39 species) were recovered from Mound A. Naiad taxa representing both Ohioan/Interior Drainage Basin (e.g., *Pleurobema clava*, *Quadrula metanevra*, *Ellipsaria lineolata*) and Cumberlandian (e.g., *Quadrula intermedia*, *Dromus dromas*, *Epioblasma arcaiformis*) origins were recovered.

Of special interest was the recovery of a right valve (missing portions of the posterior end and ventral margin) of the Pond Mussel, *Unio tetrasmus*, from the base of Mound A. Heretofore it has not been recorded from extensive aboriginal shell middens along the main stem Tennessee River (e.g., Morrison, 1942; Hughes and Parmalee 1999). In

a study dealing with the stability of recent unionid communities (Bogan, 1990) based on shell samples (ca. 278,900 valves representing 99 taxa) from 17 aboriginal sites in the Midwest and Midsouth, *Unio tetrasmus* was not listed. It has not been encountered during modern collections (e.g., Ortmann, 1925) in the main stem Tennessee River. However, Brown and Pardue (1980) reported a population of the Pond Mussel inhabiting Hurricane Creek, which generally runs north to south (Henderson and Hardin counties), that flows into White Oak Swamp. The swamp is drained by White Oak Creek which flows into the Tennessee River at approximately TRM 173.6. Brown and Pardue (1980) noted that the population of this mussel in Hurricane Creek was restricted to stretches with a tightly packed clay substrate. It was absent from other creeks adjacent to Hurricane Creek and from stretches of Hurricane Creek with substrates of predominately loose sand and gravel.



It seems unlikely that inhabitants of the Shiloh Site would have carried mussels some 25 river miles upstream from Hurricane Creek/Oak Creek (TRM173.6) to Shiloh (TRM 198.4), considering the abundant and diverse mussel fauna to be gathered easily from the shoals adjacent to the site. In all probability the Pond Mussel once inhabited creeks flowing into the Tennessee River at or near Shiloh and/or in backwater sloughs and slow moving side channels. In any case this valve of *Unio tetrasmus* represents a second record of this taxon from or adjacent to the main stem Tennessee River in Middle Tennessee and the first evidence of its use (as a food resource?) by aboriginal peoples living along the river course.

I thank David Anderson, Department of Anthropology, University of Tennessee, Knoxville and John Cornelison, National Park Service, Southeast Archaeological Center, Tallahassee, Florida, for making the molluscan material recovered at the Shiloh Site available to me for study and for permission to publish this account. Appreciation is extended to Arthur E. Bogan, North Carolina State Museum of Natural Sciences, Raleigh, for corroborating my identification of this specimen.

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## Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel *Sinanodonta woodiana* 11. News from Hungary, Poland and Ukraine

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New expansions of the distribution of the Chinese Pond Mussel *Sinanodonta woodiana* (Lea, 1834) in Europe have been reported from Poland and Ukraine. Additional information has been published recently about this invasive mussel species in Hungary, Poland, and Ukraine.

### Hungary

The Chinese Pond Mussel invaded the river Tisza some 20 years ago (Kiss, 1992). In spite of the fact that it has also been reported from the Serbian part of that river (Martinovic-Vitanovic & Kalafatic, 2002), no published data were available as to what extent the Hungarian part of the river Tisza has been invaded. This lack of information has been cleared up by the publication of Juhasz et al., 2004. According to these authors, *Sinanodonta woodiana* occurs from the upper reaches of this river near Kiskore down stream to the Tiszasziget, covering a distance of 240 km. In

that stretch of the Tisza (404-164 km) it is living in low numbers but at many places.

### Poland

Mizera & Urbanska (2003) have reported the collection of the first five specimens of the Chinese Pond mussel in fishponds near Samita, Wronki district, in July 2002. Two months later hundreds of large specimens were located in the deepest part of the ponds. According to the authors it was probably introduced to these ponds by stocking them with carp from Goslawice near Konin some five years earlier.

Domagala et al. (2004) carried out laboratory observations concerning the fertility and development of *Sinanodonta woodiana* from three reservoirs of the Konin and Patnow power plants. These reservoirs showed large differences in the mean water temperature: Lake Lichenskie - 26° Celsius, initial cooling reservoir - 32°C, and a discharge canal - 30°C. Mussels kept under artificial conditions at similar, different temperatures showed the same rate of fertility. However, those collected from the lake adapted to the artificial conditions best of all. According to the authors this indicates a possibility of further expansion to lakes of a temperature typical for the Polish climate.

Kraszewski (2004) provided important information concerning the biology, genetics, and ecology dealing with the populations of the Chinese Pond mussel living in the heated Konin lakes. Only one species is involved and it grows best in the heated parts of the lakes. The oldest individuals, aged 10 years, reached a length of 230-240 mm.

Przybylski et al. (2004) carried out experiments concerning the selection of freshwater mussels from among the four native species living in the Sulejowski Reservoir and the introduced Chinese Pond mussel from Lake Lichenskie as suitable spawning hosts by the Bitterling *Rodeus sericeus*. All the native species turned out to be suitable hosts. Although the Bitterlings showed interest in the Chinese Pond mussels and even spawned in them, the mussels managed to remove the spawn within a few seconds.

Woznicki (2004) has studied the chromosomes of *Sinanodonta woodiana* from the Konin Lakes. The diploid chromosome number turned out to be 2n=38, and the arm number (FN)=76. These numbers agree with those of most Unionid species studied so far.

### Ukraine

The first records of the presence of *Sinanodonta woodiana* from Ukraine date back to 1999, when it was found in the Danube-Sasyk Canal. In 2001, single individuals were noted in the Anankinom oxbows, and small colonies appeared in the Kuril shallows. In 2002, large colonies were living in the whole delta of the Danube on Ukrainian territory (Liashenko et al., 2003).

Yuryshynets (2004) inspected two specimens of *S. woodiana* from the Danube-Sasyk Canal for the presence of parasites. The specimens turned out to be infected by the trematode *Aspidogaster conchicola*, an unidentified species of a water

mite, and a free-living oligochaete of the genus *Chaetogaster*. All of these species are also known as parasites of the native Unionids living in that area.

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## A First Record of *Stenophysa marmorata* from Israel

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The Botanical Garden of the Tel Aviv University, Ramat Aviv, Israel, has yielded quite a number of exotic land- and freshwater molluscs. During a brief visit to the garden on 15

February 2005, another introduced aquatic snail was located in a small pond covering about 3 m<sup>2</sup>. The surface of the pond was almost entirely covered by non-flowering water hyacinth, *Eichhornia crassipes*.

While turning over some of the plants, large numbers of an unknown Physid species were located along with an exotic molluscivorous leech, *Helobdella triserialis* (Blanchard, 1849). The latter had been found many years ago in a garden pond in Kibbutz Netzer Sereni. I identified it at that time as *Helobdella punctatolineata* Moore, 1939 (Mienis, 1986); however, it is now considered by Bromley (1994) a junior synonym of *H. triserialis*.

The Physid species could be easily identified as belonging to the Marbled Aplexa, *Stenophysa marmorata* (Guilding, 1828) with the help of a recently published monograph dealing with the Physidae (Taylor, 2003). The dark median stripe on the long acuminate posterior part of the foot seems to be a good character to differentiate this species from other Physid species in the field.

According to Taylor, its natural range is restricted to a large number of Caribbean Islands, some isolated localities in Central America (Costa Rica, Panama), and the northern part of South America. It seems to occur widely in Brasil (Vaz et al., 1987) and Argentina (Rodrigues Capitulo et al., 2001). It is not clear whether the presence of *S. marmorata* in South America has to be considered part of its natural range. It is known as an exotic species in Texas, U.S.A. (Benson, 1999).

This is the first time that *Stenophysa marmorata* has been recorded from Israel. It was probably introduced with imported infected aquatic plants, either directly by the Botanical Garden or by garden centers or shops dealing in tropical aquarium fish and plants.

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# A Decade of Commercial Mussel Harvesting in Tennessee, 1992 – 2002

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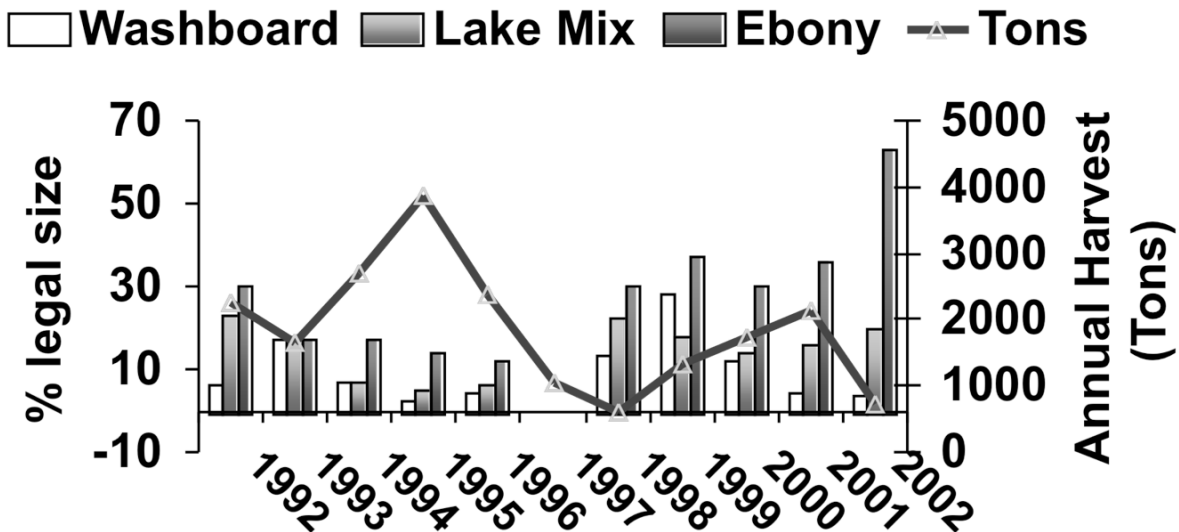
Freshwater mussel shells harvested in Tennessee are shipped to Japan, China, and other countries where they are cut and polished into beads. These beads are surgically implanted into marine oysters and freshwater mussels to form the nucleus of a cultured pearl. According to the United States Geological Survey’s “Annual Review Mineral Industry Surveys, Gemstones” approximately 96% of the shells exported from the United States in 2002 were harvested in Tennessee. During peak harvest years, the commercial mussel shell industry in Tennessee employed ~3,000 people and generated revenues approaching \$50 million. In 1995, the commercial shell industry estimated Tennessee’s mussel resources formed the base of the \$3 billion per year worldwide cultured pearl industry.

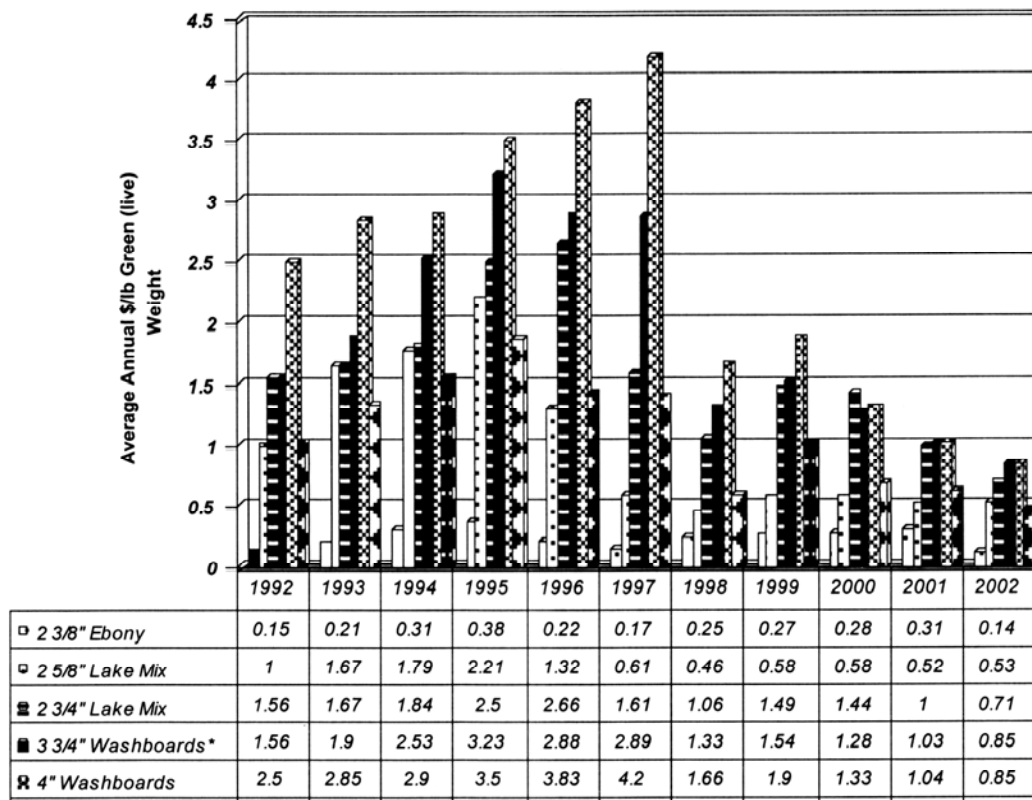
During the period of 1992-2002, Tennessee’s commercial mussel industry harvested 20,423 tons (40,846,000 lb) of freshwater mussels with an estimated **wholesale value** of \$51,575,627. **Note:** the export value is conservatively estimated to be three to five times higher than the wholesale value, at **\$154,726,880 to \$257,878,140 million**; there are instances where the mark up on some categories of shell is 7 to 12 times the wholesale value. During the same period, TWRA received \$1,095,290 from license sales and \$541,927 from the fee on mussel shells (\$0.0124/lb mussels & \$0.0145/lb shells only), representing 3.17% of the wholesale value. These figures have been used to justify an increase in the cost of commercial licenses associated with mussel harvesting in Tennessee. In April 2005, licenses will be increased as follows: resident harvester from \$125 to \$300, non-resident harvester from \$750 to \$2,000, wholesale mussel dealer from \$250 to \$500.

Commercial demand for Tennessee’s mussel shells averaged more than 2,500 tons per year the first five years (1992-1996); then declined to an average of 1,262 tons/year during 1997-2002. Kentucky Reservoir, with 110,990 surface acres on the Tennessee River in Tennessee, is the most important commercial harvest area of the state, if not the entire world, comprising over 95% of the annual shell tonnage. Fluctuating market demand throughout the decade caused negatively correlated changes in the percent of commercial mussel populations at or above legal harvest size limits. Ebony Shell (*Fusconaia ebena*) was the dominant species comprising over 40% of the annual harvest weight each year. The highly sought washboard (*Megaloniaias nervosa*) ranged from over 30% to less than 5% of the annual harvest weight during the period examined. During the decade, the wholesale weighted (by species composition) average price paid to shell harvesters fell from \$1.05 to \$0.47 per pound.

It should be noted that none of Tennessee’s 34 federal endangered mussel species experienced population declines in spite of over 100 years of commercial harvest activity. Habitat alteration through impoundment continues to be the primary factor responsible for the decline of the fauna. Proper management of the commercial resource through enforcement of open water harvest restrictions, sanctuaries, minimum size limits, and legally harvestable species continues to produce a viable shell fishery. It is incumbent upon resource managers to promote the management of sustainable commercial shell fisheries as we advance the scientific management of other better known groups such as sport fish, waterfowl, upland, and big game species.

Washboard = *Megaloniaias nervosa*, Lake Mix = *Amblema plicata*, *Fusconaia flava*, *Quadrula quadrula*, & *Q. apiculata*,  
 Ebony = *Fusconaia ebena*.





## Development of a Mollusc Fauna in a Storage Reservoir for Run Off Rainwater on the Isle of Terschelling, the Netherlands

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The local authorities of Terschelling, one of the Dutch Wadden islands, have recently decided to separate run off rainwater from the normal sewage system by transferring it to small storage reservoirs along the main road before being released in the polder ditches. One of these storage reservoirs is a small artificial pool, dug in 1999 just south of the main road near Midsland. This pool has been planted along its banks with cattails (bulrushes) *Typha*, in the center with three patches of yellow pond lilies *Nuphar lutea*, and one patch of the white water lily *Nymphaea alba* along its southern bank. This new aquatic biotope makes a natural impression, in spite of the fact that the pond and water lilies fall within the category of exotics. Slowly but steadily a natural, local flora and fauna is also establishing itself in that pool.

Mollusc species collected from storage reservoir, by date:

Scientific name*	09.10.2002	01.10.2003	05.10.2004
<i>Bithynia leachii</i> (Sheppard, 1823)	-	+	+
<i>Lymnaea stagnalis</i> (Linnaeus, 1758)	+	+	+
<i>Radix balthica</i> (Linnaeus, 1758)**	-	+	+
<i>Radix labiata</i> (Rossmassler, 1835)***	-	+	+
<i>Anisus vortex</i> (Linnaeus, 1758)	+	+	+
<i>Gyraulus albus</i> (Mueller, 1774)	-	+	+
<i>Planorbarius corneus</i> (Linnaeus, 1758)	-	-	+
<i>Planorbis planorbis</i> (Linnaeus, 1758)	-	+	+

\* In the nomenclature I have followed Falkner et al., 2001 and Falkner et al, 2002.

\*\* Until recently this species was known as *Radix ovata* (Draparnaud, 1805).

\*\*\* This seems to be the correct name for *Radix peregra* auct. non Müller, 1774.

In the autumn of three successive years (2002-2004) I have investigated the reservoir for the presence of freshwater molluscs. The results agree with my impression that in each successive year the malacological biodiversity of this new biotope is increasing. This trend may continue for several years as a number of species that occur quite commonly in the drains and ditches of the nearby polder are still missing from the list. The following species may be expected to join those already present in the storage reservoir: *Bithynia tentaculata* (Linnaeus, 1758), *Physa fontinalis* (Linnaeus, 1758), *Galba truncatula* (Mueller, 174), the semi-aquatic terrestrial snail *Oxyloma elegans* (Risso, 1826), and several species of Pea-clams *Pisidium*. During long periods of rainfall or extremely fierce downpours, water from this storage reservoir can reach a nearby ditch via an overflow in the southwest corner. However, during such rare occasions the water always flows towards the polder-ditch, making it difficult if not impossible for snails living in that ditch to crawl in the direction of the reservoir. It will be a good reason for me to sample this reservoir on Terschelling again during my next visit of the Netherlands in October 2005.

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## Helpful Hints from Hoppy:



Hoppy Says—Short of money and staff  
for evaluating mussel populations?  
Do timed Catch Per Unit of Effort  
(CPUE) and measure shell-lengths!

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*Submitted by Steve Ahlstedt*

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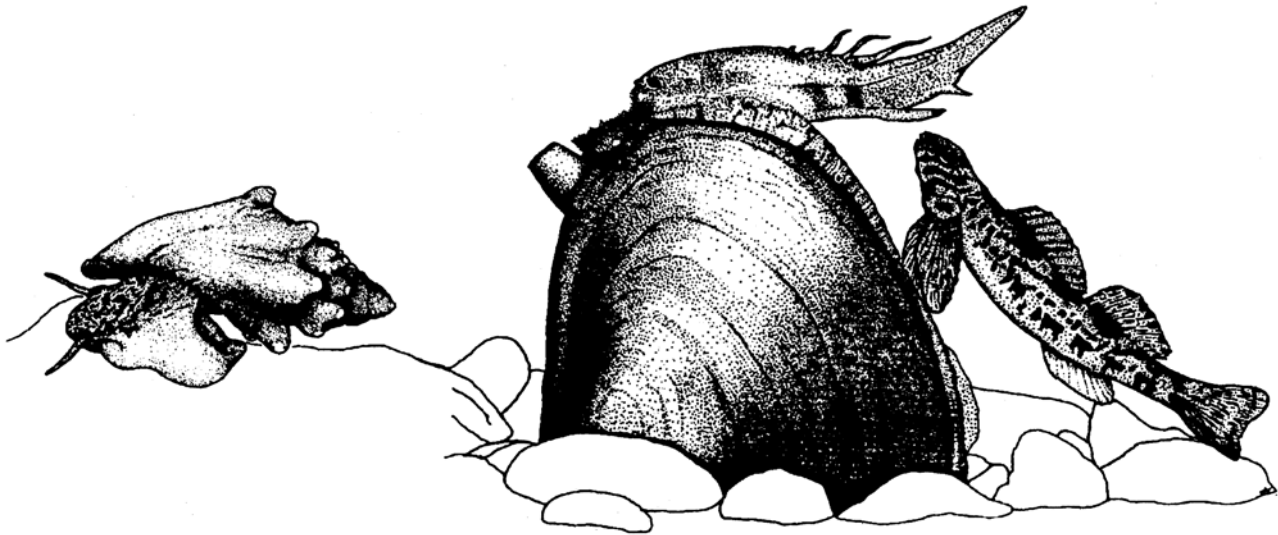
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