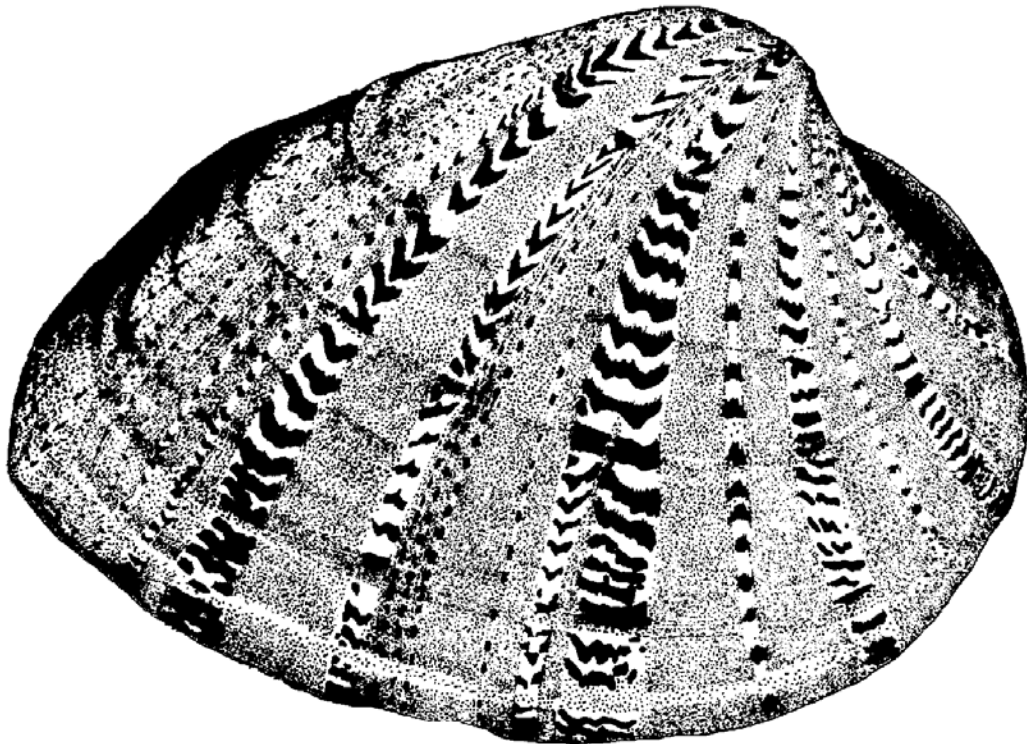


Ellipsaria

The Newsletter of the Freshwater Mollusk Conservation Society

Volume 6 - Number 1

April 2004



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Election 2004: Treasurer
2004 Workshops
2005 Symposium

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Submissions for the August 2004 issue of *Ellipsaria* may be sent in at any time but are due by July 16, 2004. 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Submissions to *Ellipsaria* are not peer reviewed, but are checked for content and general editing.

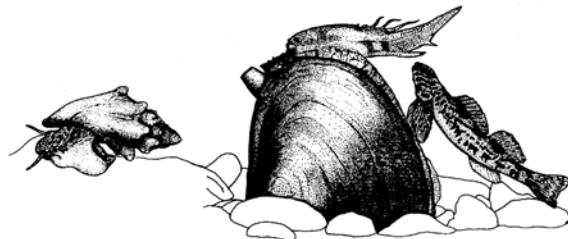
Please send change of address information to the Secretary, Rita Villella.

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Freshwater Mollusk Conservation Society



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

Water Quality and Freshwater Gastropod Workshop Tuscaloosa, Alabama March 15-19, 2004

FMCS presented the first of two workshops for 2004 in the form of the "Water Quality and Freshwater Gastropod Workshop" in Tuscaloosa, Alabama, home of the Crimson Tide. Those of you unable to attend missed an excellent and timely synthesis of two topics important to FMCS as a whole. Those of you unwilling to attend are missing the boat. After a rousing speech by yours truly, we spent two days examining topics including emerging contaminants, the TVA Reservoir Release Initiative, the status of fishes and crayfish in the American Southeast, etc. Views were shared from multiple sides of this complex fence – conservation, industry, and government. Days three and four segued into the status (poor), identification (risky), and systematics (contentious) of North American freshwater snails. The event featured concise introductions to each family, an identification workshop, and an on-going tag-team match over the Physidae. For once it was the mussel heads who were relegated to the back of the room. FMCS congratulates Chuck Lydeard, Paul Johnson, and everyone who participated in organizing and running this workshop, our gracious host (The Department of Biology of The University of Alabama), and our numerous sponsors.

The workbook from the gastropod workshop – "Showing your Shells" A Primer to Freshwater Gastropod Identification – can be downloaded from the FMCS website. The presentations will also be available for download as Power Point files.

G. Thomas Watters, FMCS President

Workshop on Conservation Genetics of Freshwater Mollusks and Fishes NCTC, Shepherdstown, WV June 29-30, 2004

The Freshwater Mollusk Conservation Society and U.S. Fish and Wildlife Service will host a workshop on conservation genetics, June 29-30, 2004, at the National Conservation Training Center in Shepherdstown, West Virginia. The workshop will provide resource managers and biologists with an opportunity to learn the principles of conservation genetics as applied to recovery of freshwater mollusks and fishes. Additional information and registration forms can be downloaded at the FMCS website or contact Dr. Richard Neves, Workshop Coordinator, at 1-540-231-5927 or mussel@vt.edu

FMCS 2004 Election - Treasurer

The current treasurer's term expires in April 2004. The new treasurer will serve for 2 years beginning in April 2004. Nominations are closed and one person has been nominated to serve. The FMCS constitution stipulates that any member can nominate any other member for treasurer. Individuals with the most nominations from the membership become an official candidate. The names of the nominees are placed on a ballot and are directly elected by the society membership.

A ballot has been included with this newsletter. Please take a few minutes to read the position statement from the candidate and return your marked ballot to Leroy Koch by **April 23, 2004**.

Everyone Loves A Symposium!

Plans are in the works for the FMCS 2005 symposium and we need your help. We want to go north, to the land of Norwegians...St. Paul, Minnesota...and are making progress. However, we need folks who can serve on the Symposium Committee with tasks like registration, program, socials, students – all the usual elements that make our meetings rule! Please contact myself or incoming president Bob Anderson and let us know what you can do to make Minnesota memorable.

Tom Watters: Watters.1@osu.edu or 614-292-6170
Bob Anderson: Robert_M_Anderson@fws.gov or
814-234-4090

*Ask not what your Society can do for you, but
what you can do for your Society.*

FMCS Board & Business Meetings

The next board meeting and general business meeting will be held in conjunction with the Genetics workshop in June at the National Conservation Training Center in Shepherdstown, West Virginia, date and times to be determined.

FMCS at AFS Annual Meeting

FMCS is sponsoring a freshwater mussel session at the 134th annual meeting of the American Fisheries Society in Madison, Wisconsin 22-26 August 2004. The session title is "Mussels in America: shells of their former selves" and will be held on Tuesday morning, August 24. Nine speakers will discuss topics that include evolution and systematics, reproduction and propagation, exotics, and contaminants. For more information, contact Jeremy Tiemann at jtiemann@inhs.uiuc.edu or Kevin Cummings at ksc@inhs.uiuc.edu

FMCS Committee Reports

Information Exchange Committee Report

Information about *Walkerana* and directions for authors has been placed on the FMCS website on the Information Exchange Committee page. Please contact Kevin Cummings if you have any questions or if you would like to submit a paper.

Outreach Committee Report

Outreach has been investing time and energy into the following efforts:

1. Assisting with the details of an obligate session on freshwater mussels for fisheries professionals at the upcoming American Fisheries Society meeting, August 2004, Madison WI. We have teamed up with symposia organizer Jeremy Tiemann to provide a comprehensive overview of mussel status, life history, ecology, survey, propagation, exotics and contaminants to raise the awareness of people who manage surface waters around the nation. Details on the meeting can be found at: <http://www.fisheries.org/html/index.shtml>
2. Production of an FMCS trade show booth display. We are now the proud parents of a pop-up display that will anchor our FMCS trade booth at the above-mentioned meeting. We need to “WOW” the fish heads and this promises to be a great opportunity! We need volunteers who can man the booth and spread the good word to the heathen masses. If you are a people-person and can swing a few days in Madison in August, contact Kurt Welke (608-273-5946) and get on the list. It's our chance to shine so please do what you can!
3. In that same vein, our Outreach Tools publication would be a great handout in Mad-town...if it were up-to-date. C'mon! Send me what you have – I'll catalogue it and add it to the database. If you don't send it, how is someone gonna know it's out there? Get on it! Now!
4. Recent emails have bounced back repeatedly- a good 1/3 of folks who stated a desire to help with Outreach have lousy email addresses or have moved on. If you still want to contribute to Outreach activities, send Kurt your email and statement of intent at: Kurt.welke@dnr.state.wi.us

Again, as always, it's our goal to serve the membership...bring it on!

Submitted by Kurt Welke

News & Announcements

Call for Land Snail Conservation

Land snails are a significant and threatened component of the non-marine molluscan fauna. An estimated 70% of land snails have imperilment ranks of G1 or G2. It is imperative that people interested in and working on land snails begin to

have better communication and work together towards conservation goals. We are seeking expression of interest in forming a land snail distribution list initially, a symposium on land snail conservation at the next FMCS meeting (March 2005), and a discussion at that meeting of perhaps forming a terrestrial mollusk conservation committee within FMCS.

If you are interested in being informed about land snail conservation activities, please contact:

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(205) 348-5828.

Seek Hidden Treasure On Line! New Internet Web Site on Freshwater Mussels of the Upper Mississippi River

A new web site on Freshwater Mussels of the Upper Mississippi River System <http://midwest.fws.gov/mussel/> is now available on the Internet. The site was created by biologists and webmasters from the U.S. Geological Survey and U.S. Fish and Wildlife Service and contains a wealth of information on identification, threatened and endangered mussels, life history and ecology, history of harvest, current threats, conservation activities, ongoing studies, and projects. Also included are a multimedia section with numerous photos, videos, and graphics on freshwater mussels and a special education section for teachers. The site highlights activities to save the federally endangered Higgins eye pearl mussel (*Lampsilis higginsii*) from extinction including propagation at Genoa National Fish Hatchery, cage culture, relocation of adults and juvenile mussels, survey and monitoring results, and information on exotic zebra mussels (*Dreissena polymorpha*).

Submitted by Gary Wege, USFWS, Bloomington, MN

2nd Annual Freshwater Mussels of the Pacific Northwest Symposium

The Pacific Northwest Native Freshwater Mussel Workgroup is hosting the 2nd Annual Freshwater Mussels of the Pacific Northwest Symposium. Presentations will focus on mussel research conducted within the Pacific Northwest. Mussel researchers Art Bogan (North Carolina Museum of Natural Sciences), Tom Watters (Ohio State University), and Catherine Gatenby (U. S. Fish and Wildlife Service, West Virginia) will be presenting along with experts from the Pacific Northwest.

Where: Vancouver, Washington
When: April 20th, 2004
Contact: Jen Stone at jen_stone@fws.gov to register

15th World Congress of Malacology

The 15th World Congress of Malacology will be held at the University of Western Australia in Perth, July 11-16 2004. For more information, go to the Uitas Malacologica website <http://www.inter.nl.net/users/Meijer.T/UM/um.html> or the Malacological Society of Australasia website <http://www.amonline.net.au/malsoc> Early registration deadline is April 30.

American Malacological Society Annual Meeting

The 70th Annual Meeting of the American Malacological Society will be on Sanibel Island, Florida, from July 31 to August 4, 2004. Check out the meeting website (<http://www.shellmuseum.org/AMS/index.htm>) often for updates. The deadline for submission of abstracts is April 15, 2004. You must register for the meeting prior to June 1st, 2004, to take advantage of the early registration rates (<http://www.shellmuseum.org/AMS/registration.htm>). In order to get the discounted hotel rates at Sundial Beach Resort make your reservation by June 18, 2004 (<http://www.shellmuseum.org/AMS/accommodations.htm>).

The 2004 R. T. Abbott Visiting Curatorship

The Bailey-Matthews Shell Museum is pleased to invite applications for the 2004 R. T. Abbott Visiting Curatorship. The Curatorship, established in accordance with the wishes of the late Dr. R. Tucker Abbott, Founding Director of the Shell Museum, is awarded annually to enable mollusk systematists to visit the museum for a period of one week. Abbott Fellows will be expected, by performing collection-based research, to assist with the curation of portions of the Museum's collection and to provide one evening talk for the general public. The collection consists of marine, freshwater, and terrestrial specimens; part of the catalogue is available at <http://www.shellmuseum.org/collection.html>. The Curatorship is accompanied by a stipend of \$1,500.

Interested malacologists are invited to send a copy of their curriculum vitae together with a letter detailing their areas of taxonomic expertise and research objectives, and to provide a tentative subject for their talk. Applications should be sent electronically no later than May 15, 2004, or postmarked by that date if sent by regular mail. The award will be announced by late June. Send materials or questions to:

Dr. José H. Leal, Director
The Bailey-Matthews Shell Museum
P.O. Box 1580
Sanibel, FL 33957
jleal@shellmuseum.org
(239) 395-2233; fax (239) 395-6706

Publications

Wisconsin Gastropods

Distribution records in the literature for Wisconsin gastropods, both freshwater and terrestrial, have been compiled in an upcoming Milwaukee Public Museum publication. It is Number 99 in the museum's Contributions in Biology and Geology series and is authored by Joan Jass of the Invertebrate Zoology Section. The compilation is priced at \$6.00, plus \$3.00 for shipping and handling. Copies may be obtained by writing to the Museum Shop, Milwaukee Public Museum, 800 West Wells Street, Milwaukee, WI 53233.

Submitted by Joan Jass

New Minnesota Mussel Field Guide

The Minnesota Department of Natural Resources announces *The Field Guide to the Freshwater Mussels of Minnesota*. Spiral bound and printed on waterproof paper, the guide contains color photographs, descriptions of shell characteristics, general habitat associations, distribution maps, and status information for the 48 freshwater species known to occur in Minnesota. This guide also contains general information about mussel biology, the importance of mussels, threats to their survival, collection methods, and collection regulations. *The Field Guide to the Freshwater Mussels of Minnesota* is intended as a tool for professionals who need to identify freshwater mussels in Minnesota.

Author: Bernard E. Sietman

Publisher: Minnesota Department of Natural Resources

Year: 2003

Pages: 144

Price: \$9.95 + shipping

Stock Number: 9-90

To order, call 1.800.657.3757 or order online:

<http://www.minnesotasbookstore.com>

Order forms available:

http://www.dnr.state.mn.us/ecological_services/nhrnp/mussel_survey/index.html#products

Submitted by Bernard Sietman; 651-282-2509

Newton, T.J. 2003. The effects of ammonia on freshwater unionid mussels. *Environmental Toxicology and Chemistry* 22:2543-2544.

Newton, T.J., J.W. Allran, J.A. O'Donnell, M.R. Bartsch, and W.B. Richardson. 2003. Effects of ammonia on juvenile unionid mussels (*Lampsilis cardium*) in laboratory sediment toxicity tests. *Environmental Toxicology and Chemistry* 22:2554-2560.

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ammonia on in situ survival and growth of juvenile mussels (*Lampsilis cardium*) in the St. Croix Riverway. *Environmental Toxicology and Chemistry* 22:2561-2568.

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Submitted by Teresa Newton

Contributed Articles

First report of the introduced freshwater bivalve, *Anodonta woodiana* (Lea, 1834) from the island of Borneo, Sabah, Malaysia

Arthur E. Bogan¹ and Menno Schilthuis²

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²Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Locked Bag 2073 88999 Kota Kinabalu, Sabah, Malaysia

Today one of the many problems facing freshwater mollusks is the increasing number of introductions of non-native species. The recent records of the introduction and expanding range of the Asian freshwater mussel, *Anodonta woodiana*, exemplify this. Watters (1997) synthesized current knowledge of the spread of this species. Using the information provided by Watters, searching the Zoological Record and back issues of *Ellipsaria*, *Anodonta woodiana* has been recently reported from Europe [Austria, France, Germany, Hungary, Italy, Poland, Romania, Slovakia, Ukraine], Singapore, Indonesian islands, Dominican Republic, Santo Domingo, and Costa Rica.

The historic freshwater bivalve fauna reported from the island of Borneo consists of 11 genera and 19 species (Haas, 1969), five of the genera and 11 of the species are endemic to Borneo and the smaller islands of Palawan and Banguay. However, this fauna did not include any species of the genus *Anodonta* or *Sinanodonta* of recent authors. Recently, one of us (MS) collected live specimens of *Anodonta woodiana* from the Donggongon Market, 10 miles southeast of Kota Kinabalu, Sabah, Malaysia [located on the northwest side of the island of Borneo]. Two voucher specimens are cataloged as NCSM 29086. This is the first record of this species from the island of Borneo.

It appears that as fish introductions occur and fish aquaculture stocks are moved around the world, this species will continue to spread. This species is very prolific and can reach large size in fish culture facilities. All fish culture facilities that are importing stock should be monitored for the appearance of this species and other species being introduced on the gills of the infected fish.

Literature Cited

Haas, F. 1969a. Superfamilia Unionacea. *Das Tierreich* (Berlin) 88:x + 663 pp.

Watters, G.T. 1997. A synthesis and review of the expanding range of the Asian freshwater mussel *Anodonta woodiana* (Lea, 1834) (Bivalvia: Unionidae). *The Veliger* 40(2):152-156.

Mussel Studies

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Clinch and Powell Rivers, TN/VA

Every five years since 1979 mussels in the Clinch and Powell Rivers are quantitatively evaluated (quadrat sampling). This has established long-term trend monitoring for mussel populations in both drainages. It was determined that only 12 sites would be evaluated in 2004 (6 in each river). Hopefully, all 12 sites will continue to be monitored in perpetuity with assistance from respective state and federal agencies in Tennessee and Virginia.

Powell River, TN/VA

Efforts are forthcoming to find gravid federally listed and state listed (VA) mussel species for culture and propagation at Virginia's Buller hatchery and Virginia Tech's mussel culture facility. This is a joint effort between Virginia Department of Fish and Game, VPI, USFWS, and USGS. Goals are to restore mussel populations in the Powell River.

Cumberland Plateau – Upper Caney Fork, TN

The upper Caney Fork drainage will be surveyed to document the current status of *Pegias fabula*, *Pleurobema gibberum*, *Lasmigona diversa*, *Venustachoncha sima*, and other mussel species as found. Three species (*P. gibberum*, *L. diversa*, and *V. sima*) are narrow endemics found only in the upper Caney Fork system.

Cumberland Plateau/Lower Tennessee/ Mobile River Basin

Survey work will continue on the Cumberland Plateau and in the lower Tennessee, Cumberland, and Mobile River basins to find T & E species and identify habitats for mollusk restoration. This is a Species at Risk project funded by the USGS and USFWS.

Big South Fork Cumberland (TN), Clinch River (TN), Paint Rock River (AL), Mobile River Basin

Continue assisting with the collection of gravid T & E mussel species for culture and propagation at Virginia Tech's mussel culture facility and Tennessee Aquarium Research Institute's mussel culture facility located in Cohutta, Georgia.

Recovery Plan Development for Tennessee and Cumberland River Basins

Efforts are underway to develop a recovery plan for mussels in the Tennessee and Cumberland River basins. This is a joint effort at identifying the most critically rare species and prioritizing which species to concentrate on first that are recoverable or offer the best chances for success. Some species are at critical low levels and may not survive the next ten years. State and federal agencies involved with this process include: TN, KY, VA, NC, USGS, and USFWS.

2003 Follow-up on a 2002 Mussel Translocation, Mississippi River Mile 818.9, Cottage Grove, MN

Marian E. Havlik
Malacological Consultants, La Crosse, WI 54601-4969
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On 15-16 May 2003, Malacological Consultants conducted a follow-up of a mussel translocation completed July 2002, from Mississippi River Mile 818.9. The 52258 m² project area extended from the Left Descending Bank south to the Mississippi River Main Channel.

The 2002 translocation, done prior to burial of a new wastewater treatment disposal pipe, yielded a mean density of 0.38/m² (23 living species) among 19,630 mussels, 7.33% of which represented two Minnesota endangered and five Minnesota threatened unionid species.

In May 2003, 609 live mussels (18 species) were recovered from Translocation Sites 1 and 2; 515 specimens were numbered and marked. Two Minnesota endangered species, *Arcidens confragosus* and *Quadrula nodulata*, represented 53.9% of the mussels found. Most of these mussels were again measured and externally aged; they represented a variety of size classes. Of 232 numbered *Q. nodulata*, 228 were recovered alive (98.3% survival). All but one of 76 numbered *A. confragosus* were living (98.7% survival). One each of numbered *Tritogonia verrucosa*, *Obovaria olivaria*, and *Ligumia recta* were recovered alive.

The survival of all numbered Minnesota special status species was 98.36%; most were from an area <1 meter deep near the south edge of the old Ninninger Channel at Translocation Site 1. The overall survival of all hash-marked and numbered mussels was nearly 97.2%. Most numbers engraved on special status mussels were still very legible.

Over 12.6% of the numbered mussels had disturbance rings, as evidenced by uneven periodicity of rest rings; 3% of the numbered mussels showed little or no growth. In addition to the living species, five additional species were represented by sub-fossil shells, mostly from the old Channel. No new living mussel species were found in 2003. The substratum was mostly mud with a great deal of woody debris, especially in the old Channel. Immediately upstream of Site 1 the substratum becomes sandy – no numbered mussels had moved into this area. Slightly more *Dreissena polymorpha* were found on native mussels in 2003 than in 2002, ranging from one to several on a single unionid. Three PVC pipes marking the original 2002 project site remained in place in 2003, indicating that direct construction impacts were unlikely to have extended past the marked project area. This mussel translocation was successful after one year, in both deep and shallow habitats.

Two fish species identified as hosts for winged mapleleaf (*Quadrula fragosa*)

Mark Steingraeber¹, Mark Hove², Michelle Bartsch³, Dan Hornbach⁴, Carrie Nelson², Teresa Newton³, John Kalas¹, Anne Kapuscinski², and Erick Simonsen²

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The winged mapleleaf is a federally endangered freshwater mussel that has received considerable management attention in recent years. Once found throughout many Midwestern rivers, only two known populations exist (Posey *et al.* 1996, U.S. Fish and Wildlife Service 1997), one of which is in a 10-mile stretch of the St. Croix National Scenic Riverway that borders Minnesota and Wisconsin. This population is at risk from zebra mussel infestation, the effects of variable water releases at an upstream hydropower dam, and an incomplete knowledge of its life history. Among the recognized factors that are limiting the recovery of this mussel is the lack of information regarding which species of fish can serve as a host for its glochidia. Since 1997, a team of biologists working at the University of Minnesota (UMN) has conducted research to identify suitable host fish species for this endangered mussel. Beginning in 2001, Department of the Interior colleagues working in western Wisconsin at the U.S. Fish and Wildlife Service's La Crosse Fishery Resources Office and Genoa National Fish Hatchery, the National Park Service's St. Croix National Scenic Riverway in St. Croix Falls, and the U.S. Geological Survey's Upper Midwest Environmental Sciences Center (UMESC) in La Crosse joined other team members in cooperative annual efforts to expand and accelerate the laboratory host fish identification program by making use of the well-equipped aquatic research facilities available at the UMESC.

Prior to 2003, more than 60 species of fish comprising 14 taxonomic families had been investigated as potential host fish for winged mapleleaf glochidia. These early efforts achieved limited success with only certain catfish species (Family Ictaluridae) because the long-term tests were often beset by problems (*e.g.*, fish mortality). A laboratory study initiated in 2000 yielded a small number of juvenile winged mapleleaf from channel catfish (Hove *et al.* 2002), but subsequent efforts to continue the annual host suitability tests were severely limited in 2001 and 2002 due to little or no reproduction among winged mapleleaf in the St. Croix River. We speculate that this diminished reproductive success was due, in part, to the large amounts of sediment that were deposited on winged mapleleaf during a 100-year flood that occurred here in the spring of 2001. In the summer of 2003, an interagency dive

team stockpiled adult winged mapleleaf in the St. Croix River into small aggregations to increase chances for successful reproduction. Divers returned early in the fall and collected several gravid females in and outside of aggregations that later released large numbers of viable glochidia for testing. These glochidia were used to infest the gills of four Ictalurid species (blue catfish, channel catfish, flathead catfish, and slender madtom) in similar temperature-controlled tests that were initiated in early October at both the UMESC (19°C) and the UMN (22°C). While test fish were of uniform size for most species, two distinct sizes of channel catfish were available and tested at the UMESC. Approximately 8 to 12 weeks after the fish were infested, a total of about 11,000 living juvenile winged mapleleaf mussels were recovered from 20 blue catfish and about 10,000 juveniles were recovered from 25 channel catfish at the UMESC. Among the channel catfish that were tested here, a group of five larger-sized fish (mean total length 282 mm) accounted for 94% of the juvenile mussels produced by this species. Blue and channel catfish tested at the UMN were infested with fewer glochidia and host suitability trials here produced a total of 700 juvenile winged mapleleaf.

In mid-November, dive team members placed most of the juveniles available from the UMESC and the UMN into cages that were submerged at sites near existing mussel beds in the St. Croix River. The survival of these mussels will be checked later in 2004. Many of the remaining juveniles at the UMESC were maintained with tempered (17-19°C) Upper Mississippi River water and St. Croix River sediment (1-2 mm fraction) until early in January (2004) when all of the surviving juveniles (about 450 produced by the large channel catfish) were used in a laboratory test to determine over-winter survival rates at 5°C and 19°C. However, this planned long-term test was discontinued after only 2 weeks when initial observations indicated excessive mortality (> 85%) in both treatments. Meanwhile, the remaining juveniles at the UMN were held in 19°C water and sediment (0.1-0.5 mm fraction) from the St. Croix River. These juveniles survived and grew for 3 months before mortality ended the study here.

Finally, seven of the twelve larger-sized channel catfish infested at the UMESC and their attached winged mapleleaf glochidia were placed in a cage that was submerged in a pond here in November to overwinter. Surviving fish will be retrieved from the pond in early spring and placed in separate laboratory aquaria where water temperature will be regulated daily to mimic that of the St. Croix River and the contents will be siphoned daily to enumerate juvenile mussels that transform under a more natural thermal regime.

The overwhelming test results we achieved in 2003 conclusively indicate that both blue catfish and channel catfish are suitable hosts for glochidia of the endangered winged mapleleaf mussel. These findings may soon be applied to artificially propagate winged mapleleaf juveniles for augmentation of existing populations and for reintroduction at Mississippi River basin sites within the species' historic range where populations have long been absent.

We thank Macalester College, the National Park Service (St. Croix National Scenic Riverway), the U.S. Fish and Wildlife Service (Twin Cities Ecological Services Office), the U.S. Army Corps of Engineers (St. Paul District), and the University of Minnesota for funding this work.

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Additional information concerning the conquest of Europe by the invasive Chinese Pond Mussel *Sinanodonta woodiana* 9. News from Belgium, Italy, Romania and Serbia

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The invasive Chinese Pond Mussel *Sinanodonta woodiana* (Lea, 1834) continues to remain in the news in Europe. Before I summarize the recently published information concerning this subject, I will devote a few lines to the controversy whether *woodiana* should be placed in *Anodonta* or *Sinanodonta*.

Huang et al. (2002) published the results of their analysis of partial mitochondrial 16S rRNA sequences of 13 unionid bivalve species from China. The results were compared with those obtained by Lydeard et al. (1996) on freshwater bivalves from North America. The Chinese Pond Mussel turned out to be more closely related to *Cristaria plicata* (Leach, 1815), another Chinese species, than to the American *Anodonta couperiana* (Lea, 1840). Although they maintained the Chinese Pond Mussel in the genus *Anodonta*, their results confirmed the morphological studies of the sculpture of the juvenile shells by von Ihering (1893) and Falkner (1994), who concluded that *Anodonta woodiana* is more related to *Cristaria plicata* than to the European representatives of the *Anodontinae*. These results show that the name *Sinanodonta woodiana* is more appropriate than *Anodonta woodiana*.

Belgium

In the summer of 1999 the first specimens of the Chinese Pond Mussel were collected in a recreation-pond in Diest, Belgium (Sablon, 2002). My Belgian colleague Marc Keppens sampled the same pond again in the spring of 2003. This exotic species was the most numerous among the mussels in that pond. Besides the allochthonous *Sinanodonta woodiana*, he encountered two autochthonous mussel species, *Anodonta cygnea* (Linnaeus, 1758) and *Unio pictorum* (Linnaeus, 1758), the first in slightly lesser numbers than *Sinanodonta*, the latter only rarely. No clue could be detected on how this species reached that pond. Naturalists in the Flemish part of Belgium were invited to look for this large mussel in other aquatic habitats. The most important characters used to differentiate between the exotic mussel and the local ones were provided in order to facilitate a proper identification (Keppens & Mienis, 2004).

Italy

Manganelli et al. (1998) were the first to record the Chinese Pond Mussel from two different localities in Italy. Recently Niero (2003) could add 10 new localities, which were discovered in the period 1999-2002. Eight widely separated populations were located in the greater Venetian area and two in Central Italy: one in Lake Primera and the Ombrone stream near Pistoia, another in the irrigation canals of Maccarese, North of Fiumicino (Roma). At several localities, *Sinanodonta woodiana* reached the impressive size of 250 mm.

Romania

Ponta et al. (2002) carried out a survey of the presence of copper, manganese, and zinc in sediments and aquatic animals collected in the basin of the White Cris and the Black Cris rivers in West-Romania. Among the animals were specimens of *Sinanodonta woodiana*, but for unknown reasons no results are given concerning the presence of Cu, Mn, and Zn in the latter.

From the zoogeographic point of view it is important to know that *Sinanodonta* lives in these mountain rivers. As a matter of fact it does not come as a surprise, because both the White and the Black Cris are tributaries of the Körös River in Hungary, which is an affluent of the Tisza River. From the latter river this invasive mussel was already known for a long time; however, it means that the Chinese Pond Mussel may be expected to occur throughout the whole drainage basin of the river Tisza in Hungary, Romania, and Serbia (see below).

Serbia

Sinanodonta woodiana was encountered in both the Tisa and its main tributary the Begej during a limnological survey of the Serbian part of the river Tisa (=Tisza) (Martinović-Vitanović & Kalafatić, 2002). The Tisa enters the Danube in Serbia; the latter formed the only locality of the Chinese Pond Mussel in the Federal Republic of Yugoslavia (Anonymous, n.d.). However, all other tributaries of the Danube, not only in that area but also along its length in Central Europe, may hide populations of this exotic mussel.

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On the Presence of the River Limpet *Ancylus fluviatilis* in Israel

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Some 20 years ago Schütt (1982) and Kinzelbach (1986) published important data concerning the presence of the River Limpet *Ancylus fluviatilis* Müller, 1774, Family Planorbidae, in the Middle East. Unfortunately their lists did not contain any firsthand records of this western Palaearctic species from Israel.

Only Kinzelbach (1986) mentioned the record by Bodenheimer (1935) of *Ancylus fluviatilis* as living on Papyrus reeds near the influx of the Jordan River into (the former) Lake Hula. Although Bodenheimer's crude figure may represent a schematic drawing of *Ancylus*, it is much more likely that either *Acroloxus* or *Ferrissia* was encountered on the 'reeds', because the River Limpet never adheres to such a substrate.

Since the annexation of the Syrian Golan Heights by Israel in 1967, numerous surveys have been carried out on the streams descending from the Golan westwards towards the Jordan River or the northeastern part of the Sea of Galilee. During several occasions large numbers of *Ancylus fluviatilis* were encountered adhered to boulders in at least four of these permanent streams.

The National Mollusc Collection of the Hebrew University of Jerusalem (HUJ) has samples from the following localities, arranged from north to south:

Nahal Orvim, in 'Ein Hajal, leg. Ch. Dimentman, 9 July 1967; Nahal Orvim, north of Kfar 'Ein Hajal leg. Ch. Dimentman, 9 July 1969; Nahal Orvim, near TAP-line, leg. Ch. Dimentman, 6 May 1971; Nahal Orvim, near Wasit, leg. Ch. Dimentman, 12 December 1971; Nahal Orvim, leg. Ch. Dimentman, 6 February 1972; Nahal Zawitan, leg. G. Herbst, 3 March 1985; Nahal Yehudiyya, leg. G. Herbst, 3 March 1985; Nahal Daliyyot, leg. Glaser, 20 August 1985.

All these localities are situated in the northern and central part of the Golan Heights, a rather restricted geographical area. However, the presence of *Ancylus* in these watercourses is not endangered as long as the latter remain perennial streams.

In addition to the localities where living snails were encountered, a single empty shell has been found in drift of the Sea of Galilee (=Yam or Lake Kinneret) near Zemach. This specimen makes the impression of being of recent origin; however, not a single living River Limpet has ever been collected in the lake (Tchernov, 1975).

Ancylus fluviatilis can not be considered a recent element in the freshwater mollusc fauna of Israel because it has been reported as a Pleistocene fossil from Deganya A, just south of the Sea of Galilee by Petrbock (1946) (material from the same layers is also present in the HUI-collection). Noetling (1886) has reported it from similar fossil layers of the Yarmouk River, which forms the border between Israel and Jordan at the southern end of the Golan Heights.

I like to thank my colleagues Dr. Chanan Dimentman (Hebrew University of Jerusalem) and Dr. Reuven Ortal (Israel Nature Reserves and National Parks Authority, Jerusalem) for permanently lodging the discussed material in the National Mollusc Collection of the Hebrew University of Jerusalem.

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Preliminary report on the freshwater mollusk fauna of Mampituba river basin, Santa Catarina State, Southern Brazil

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Mampituba river basin is a little part of the Santa Catarina's state Atlantic Coastal Plain, with discharge into the Atlantic Ocean, Southern Brazil, localized in the Municipal District of São João do Sul, southernmost territorial state portion, bordering with the state of Rio Grande do Sul – RS (see Agudo 2004a). Its course and bed are formed, basically, of

rolled basaltic stones, presenting an abundant and diversified aquatic vegetation in its riversides, mainly the species *Salvinia auriculata*, *Cabomba australis*, *Hydrocotyle ranunculoides*, *Eichhornia azurea*, *Pistia stratiotes*, and *Eichhornia crassipes* (Cordazzo & Seeliger 1995).

The surrounding land in the basin is used for wide cultivations of irrigated rice, *Oryza sativa*, offering more an aquatic habitat for some of the lifted local/regional species of mollusks (Pereira et al 2000, p. 144), particularly *Biomphalaria* spp in this case.

Between July of 2003 and February of 2004, 12 freshwater species (8 Gastropoda: 3 Prosobranchia & 5 Pulmonata; and 4 Bivalvia: 3 Unionoida & 1 Veneroida, invasive exotic form) were included in this regional study (for a visual of the zoogeographical records in this Brazilian territory, see Agudo 2004b). Other reports, corresponding to indeterminate freshwater gastropod species, are deposited in the collection of RS (Lab. Malacologia/FaBio/PUCRS) for specific identification.

Also collected in this preliminary malacological inventory were two terrestrial slugs: *Belocaulus angustipes* (Heynemann, 1885), native species, and *Deroceras* (= *Agriolimax*) *laeve* (= *laevis*), invasive exotic form, agricultural pests in the region.

Systematic Freshwater Species List

Class GASTROPODA

Subclass Prosobranchia

Family AMPULLARIIDAE (2)

Pomacea bridgesii (Reeve, 1856)

Pomacea canaliculata (Lamarck, 1819)*

*Obs.: Abundant reddish (due to the high carotenoid content) eggs to the species are observed in the regional austral summer attached on aquatic plants *Pistia stratiotes* and *Eichhornia* spp.

Family HYDROBIIDAE (1)

Heleobia piscium (= *australis*) (Orbigny, 1835)

Subclass Pulmonata

Family SUCCINEIDAE (1)

Omalonyx unguis (Ferussac in d'Orbigny, 1841)

Family CHILINIDAE (1)*

Chilina fluminea (Orbigny, 1835)

*Obs.: In previous articles (Agudo 2003 a, b) the family CHILINIDAE appeared included "mistakenly" in the Subclass Prosobranchia.

Family LYMNAEIDAE (1)

Pseudosuccinea (= *Lymnaea*) *columella* Say, 1817

Family PLANORBIDAE (2)

Biomphalaria glabrata (Say, 1818)

Biomphalaria tenagophila (Orbigny, 1835)

Class PELECYPODA = BIVALVIA

Order Unionoida

Family MYCETOPODIDAE (1)

Anodontites trapesimalis (Lamarck, 1819)

Family HIRIIDAE (2)

Diplodon expansus (Küster, 1856)

Diplodon hildae Ortmann, 1921
Order Veneroida
Family CORBICULIDAE (1)
Corbicula largillierti (Philippi, 1844)

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The freshwater mollusk fauna of Santa Catarina State, Southern Brazil: a comprehensive general synthesis

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Continental malacological fauna survey: Santa Catarina
state: Southern Brazilian country: Knowledge synthesis

Recently, more two new reports of freshwater mollusks – snail *Pedipes mirabilis* (Mohlfeld, 1816) and mussel/naiade, *Anodontites crispatus tenebricosus* (Wagner in Spix, 1827) – were included in the regional inventory of continental mollusks from Santa Catarina State (for a list of the zoogeographical records in this Brazilian territory, see Agudo 2004a), elevating the number of freshwater species to

39 (26 Gastropoda: 9 Prosobranchia & 17 Pulmonata: 13 Bivalvia: 9 Unionoida & 4 Veneroida), from previous field studies (Agudo 2003 c) that included five invasive exotic forms: *Melanoides tuberculatus* (Müller, 1774), *Bulinus tropicus* (Krauss, 1848), *Physa acuta* (= *cubensis*) Draparnaud, 1805, *Corbicula fluminea* (Müller, 1774), and *Corbicula largillierti* (Philippi, 1844).

According to previous short articles (Agudo 2002, 2003 a, b, c), the state of Santa Catarina (SC) is part of Brazil's southernmost region, situated between the states of Paraná (PR) and Rio Grande do Sul (RS). Santa Catarina is geographically divided into three large parts (see Agudo 2004b): the Atlantic Coastal Plains, with several rivers that discharge into the Atlantic Ocean, and two independent great River Basin Systems, in the central and western Highlands – the Iguazu (= Iguaçu, to the north) and the Uruguay (= Uruguai, to the south). Until now only some hydrographical portions of Atlantic coastal plains (the best studied up to now) and of Rio Uruguay they were covered by us.

Systematic Species List

Class GASTROPODA

Subclass Prosobranchia

Family AMPULLARIIDAE (7)

Asolene megastoma (Sowerby, 1825)

Felipponea iheringi (Pilsbry, 1983)

Pomacea bridgesii (Reeve, 1856)

Pomacea canaliculata (Lamarck, 1819)

Pomacea insularum (Orbigny, 1839)

Pomacea paludosa (Say, 1829)

Pomacea sordida (Swainson, 1822)

Family HYDROBIIDAE (1)

Heleobia piscium (= *australis*) (Orbigny, 1835)*

*Obs.: Estuarine species ...

Family THIARIDAE (= MELANIIDAE) (1)

Melanoides tuberculatus (Müller, 1774)

Subclass Pulmonata

Family SUCCINEIDAE (1)

Omalonyx unguis (Ferussac in d'Orbigny, 1841)

Family ANCYLIDAE (1)

Gundlachia (= *Hebetancylus*) *moriciandi* (Orbigny, 1846)

Family CHILINIDAE (3)*

Chilina fluminea (Orbigny, 1835)

Chilina globosa Frauenfeld, 1881

Chilina parva Martens, 1868

*Obs.: In previous articles of this study (Agudo 2003 a, c) the family CHILINIDAE appeared included “mistakenly” in the Subclass Prosobranchia.

Family ELLOBIIDAE (1)

Pedipes mirabilis (Mohlfeld, 1816)*

*Obs.: Estuarine species ...

Family PHYSIDAE (3)

Physa acuta (= *cubensis*) Draparnaud, 1805

Stenophysa (= *Aplexa*) *marmorata* Guilding, 1828

Stenophysa (= *Aplexa*) *rivalis* (Maston & Rackett, 1898)

Family LYMNAEIDAE (1)

Pseudosuccinea (= *Lymnaea*) *columella* Say, 1817

Family PLANORBIDAE (7)

- Biomphalaria glabrata* (Say, 1818)
- Biomphalaria occidentalis* Paraense, 1981
- Biomphalaria oligoza* Paraense, 1981
- Biomphalaria straminea* (Dunker, 1848)
- Biomphalaria tenagophila* (Orbigny, 1835)
- Bulinus tropicus* (Krauss, 1848)
- Drepanotrema cimex* (Moricand, 1838)

Class PELECYPODA = BIVALVIA

Order Unionoida

Family MYCETOPODIDAE (6)

- Anodontites crispatus tenebricosus* (Lea, 1834)
- Anodontites ferrarisi* (Orbigny, 1835)
- Anodontites trapesialis* (Lamarck, 1819)
- Leila blainvilliana* (Lea, 1834)
- Monocondylaea minuana* Orbigny, 1835
- Mycetopoda legumen* (Martens, 1888)

Family HIRIIDAE (3)

- Diplodon ellipticus* (Wagner in Spix, 1827)
- Diplodon expansus* (Küster, 1856)
- Diplodon hildae* Ortmann, 1921

Order Veneroida

Family CORBICULIDAE (2)

- Corbicula fluminea* (Müller, 1774)
- Corbicula largillierti* (Philippi, 1844)

Family SPHAERIIDAE (2)

- Eupera klappenbachi* Mansur & Veitenheimer, 1975
- Eupera platensis* Doello-Jurado, 1921

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A Qualitative and Quantitative Survey of the Unionid Mussels of the South Fork of the Wood River, Burnett County Wisconsin: From Dunham Lake to the St. Croix River

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During the summer of 2003, nine students from Grantsburg High School and their instructor collected a variety of mussels at 16 sites on the Wood River, Burnett County, Wisconsin. We sampled an approximate 22 mile stretch of the river from Dunham Lake to the confluence with the St. Croix River. There are two small dams on the river – one forms Memory Lake in the village of Grantsburg, and a second is a mill dam between Little and Big Wood Lakes.

Mussels and substrate were collected from 10 replicate 0.25-m² quadrates at each location. If the section of the river was more than 10 meters wide, we measured 50 meters and placed five quadrates inshore and five offshore in midstream. If the river was less than 10 meters wide, we measured 100 meters and placed the quadrates alternating inshore and offshore every ten meters. Substrate was separated into five size classes (0.5 mm, 6 mm, 14 mm, 81 mm, and 152 mm) and weighed. All live mussels were identified, measured, and returned to their original location. An additional 1-person/hour qualitative search was conducted at each site. These mussels were identified, measured, and then returned to the river.

Substrates from Dunham Lake to Big Wood Lake were predominantly sand (>60%) with the exception of the site below the mill dam, which had variable substrate with no size class accounting for more than 30%. All six sites between Big Wood Lake and Memory Lake had greater than 90% sand substrate. Sites between Memory Lake and the St. Croix River had variable substrate and velocity.

Fifteen living species (Table 1) were identified including a state species of special concern, elktoe (*Alasmidonta marginata*) and round pigtoe (*Pleurobema sintoxia*). The most abundant species found was the Wabash pigtoe (*Fusconaia flava*). A single creek heelsplitter (*Lasmigona compressa*) was collected, which was the first identified in the county. An additional three species – pimpleback (*Quadrula pustulosa*), lilliput (*Toxolasma parvus*) and paper pondshell (*Utterbackia imbecillis*) – were represented by empty shells. Densities were highest (13.6 mussels/m²) below the Memory Lake Dam, compared to a mean of 1.7 mussels/m² at all other sites. Mean species richness was highest between the Memory Lake Dam and the St. Croix River (6.0 species/site) compared to 2.6 species/site upstream of the dam.

Table 1. Data for freshwater mussel species found on the Wood River.

Species	No. Live	% Community	Freq.	Live Length Range (mm)	X Live Length	Std. Dev. Live Len. (mm)
<i>Actinonaias ligamentina</i> (Lamarck, 1819)	19	7	18.8	24-119	98.2	33.07
<i>Alasmidonta marginata</i> (Say, 1818)	2	1	6.3	54-74	64.2	13.85
<i>Amblema plicata</i> (Say, 1817)	25	9	18.8	43-131	95.4	19.61
<i>Anodontooides ferussacianus</i> (Lea, 1834)	14	5	25.0	51-126	85.9	20.85
<i>Elliptio dilatata</i> (Rafinesque, 1820)	43	15	25.0	14-16	176.5	27.44
<i>Fusconaia flava</i> (Rafinesque, 1820)	62	22	62.5	18-87	49.9	16.28
<i>Lampsilis cardium</i> Rafinesque, 1820	30	11	37.5	76-93	87.1	6.50
<i>Lampsilis siliquoidea</i> (Barnes, 1823)	23	8	43.8	32-114	77.2	22.41
<i>Lasmigona compressa</i> (Lea, 1829)	1	0	6.3	85	84.8	
<i>Lasmigona costata</i> (Rafinesque, 1820)	5	2	6.3	11-110	67.3	51.42
<i>Leptodea fragilis</i> (Rafinesque, 1820)	2	1	12.5	100-119	109.9	13.48
<i>Ligumia recta</i> (Lamarck, 1819)	4	1	12.5	101-120	104.3	4.03
<i>Pleurobema sintoxia</i> (Rafinesque, 1820)	5	2	18.8	51-90	57.8	18.97
<i>Pyganodon grandis</i> (Say, 1829)	30	11	18.8	61-161	103.7	20.73
<i>Quadrula pustulosa</i> (Lea, 1831)	0					
<i>Strophitus undulatus</i> (Say, 1817)	20	7	37.5	42-110	66.9	13.65
<i>Toxolasma parvus</i> (Barnes, 1823)	0					
<i>Utterbackia imbecillis</i> (Say, 1829)	0					

Potamilus capax found in the Lower Mississippi River Channel

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In October, 2003, the Mississippi Museum of Natural Science reported the collection of a fresh dead *Potamilus capax* from a secondary channel of the Mississippi River. The collection site was on the state's Shipland Wildlife Management Area, at approximately Mississippi River Mile (MRM) 485. On October 28 and 30, cursory surveys of the main and secondary channels were conducted between MRM 481-489. River stage was low, approximately 8 feet on the Vicksburg gauge. The area is a long bend of the Mississippi River, with the main channel running along the west bank, and a large secondary channel dissected by dikes (raised rock levees usually constructed perpendicular to the bank) along the east bank. Survey efforts resulted in the collection of 1 live *P. capax*, 14 fresh dead, and several weathered dead shells. An additional 7 unionid species were also found (*Potamilus ohioensis*, *P. purpuratus*, *Leptodea fragilis*, *Lampsilis teres*, *Strophitus undulatus*, *Toxolasma parvus*, and *Pyganodon grandis*), along with *Corbicula fluminea* and *Dreissena polymorpha*. Unionid mussels generally were associated with dikes and pools between dikes in the secondary channel. Most *Potamilus capax* were collected on or below the dikes in the secondary channel. Two fresh shells were found deposited between dikes in dewatered portions of the secondary channel. One fresh shell was found between dikes in the main channel. The live *P. capax* was found in gravelly sand along the upstream face of a dike (MRM ~482.5). No *P. capax* were found in the lentic pools between the dikes. Cursory surveys of main channel dikes in the vicinity of Vicksburg, Mississippi, (MRM 440, 440.5, 447, 448) have failed to find any evidence of the species. Additional surveys are needed to determine if this is an isolated situation, or if *P. capax* is exploiting dike fields in secondary channels of the Mississippi River.



Juvenile pink heelsplitter

Suitable host fish species determined for hickorynut and pink heelsplitter

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Identifying hosts that facilitate glochidia metamorphosis is an important part of developing recovery plans for many unionids (NNMCC 1998). Glochidia hosts for hickorynut, *Obovaria olivaria* (Rafinesque, 1820) and pink heelsplitter, *Potamilus alatus*

(Say, 1817) have been described but additional information is needed. Coker *et al.* (1921) reported shovelnose sturgeon, *Scaphirhynchus platyrhynchus* (Rafinesque, 1820), naturally infested with hickorynut glochidia and that these fish facilitate glochidia metamorphosis. However, the number of fishes tested and juveniles produced were not reported. Pink heelsplitter are known to infest freshwater drum, *Aplodinotus grunniens* Rafinesque, 1819, under natural conditions (Howard 1913) but it has not been determined if drum facilitate glochidial metamorphosis. The purpose of this study was to identify suitable host species for hickorynut and pink heelsplitter glochidia. Mussel and fish nomenclature follows Turgeon *et al.* (1998) and Robins *et al.* (1991), respectively.

Hickorynut

The hickorynut is listed as endangered in the state of Ohio, and the only reported host is the shovelnose sturgeon. Due to disease concerns, the Genoa National Fish Hatchery (NFH) is unable to bring shovelnose sturgeon on to the hatchery, therefore we tested lake sturgeon, *Acipenser fulvescens* Rafinesque, 1817, as a possible new host fish for the hickorynut. Lake sturgeon are produced by Genoa NFH as part of ongoing lake sturgeon restoration programs. Eight lake sturgeon were infested by being placed in a bucket containing one liter of water and glochidia from two female hickorynut for approximately five minutes. Fish were held in a 38 L aquarium and checked for juveniles every other day until juveniles were found and then were siphoned daily afterwards. The first juveniles were collected 15 days post infestation with a total of 2240 juveniles being produced thus proving lake sturgeon to be a suitable host species for hickorynut.

Pink heelsplitter

We determined suitable host species for pink heelsplitter by artificially infesting fishes with glochidia in the Wet Laboratory, UMN. Brooding pink heelsplitter were collected during late June 2003 from the St. Croix River. Fishes were collected from central and southern Minnesota and held in the laboratory approximately two months before being used in host suitability trials. We exposed fishes to glochidia suspended in an aquarium using heavy aeration for 2-5 minutes. Infested fish were held in flow through aquaria at 19 °C. A single freshwater drum artificially infested with glochidia facilitated metamorphosis of 219 juveniles starting 22 days after infestation up to 44 days at which time the fish died. A single black bullhead, *Ameiurus melas* (Rafinesque, 1820), sloughed pink heelsplitter glochidia within 1-4 days.

These results shed light on mussel host relationships for these species. This is the first time lake sturgeon have been reported as a suitable host fish for the hickorynut. By combining Genoa NFH's lake sturgeon and mussel propagation programs, the initial step for any recovery efforts of the hickorynut have been laid. We believe this is the first published record of freshwater drum facilitating pink heelsplitter metamorphosis. However, this is based on the observation of a single fish. Additional studies are needed to confirm the suitability of this species, and determine the host status of other fish species.

We received support from several organizations. Genoa NFH would like to thank Dave Heath from Wisconsin DNR for collecting the gravid mussels used for our study. The UMN thanks the U.S. Fish and Wildlife Service and St. Croix National Scenic Riverway, National Park Service for financial support, and Wisconsin Department of Natural Resources for equipment used in this study.

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Helpful Hints from Hoppy:



Don't be a bank walker...get your head in the water and see what you're missing. Dig!!!

Submitted by Steve Ahlstedt

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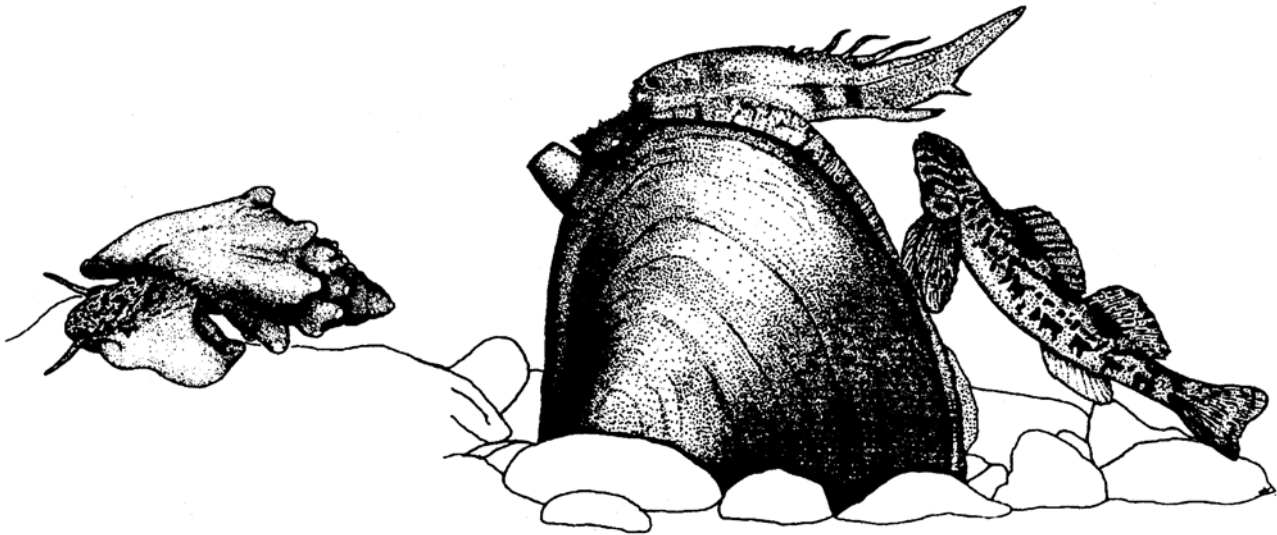
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