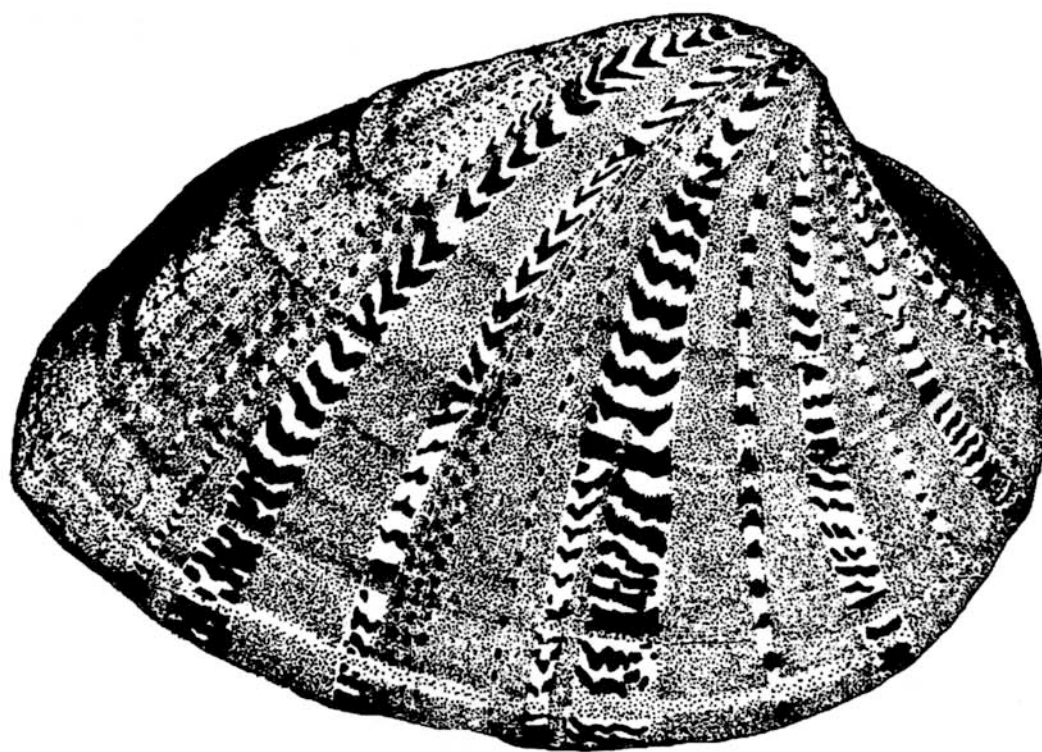


Ellipsaria

The Newsletter of the Freshwater Mollusk Conservation Society

Volume 2 – Number 2

August 2000



This issue of *Ellipsaria* contains:

2001 FMCS Symposium Information and the First Call for Papers
2000 FMCS Membership Roster
A Current Molluscan Bibliography
Other News and Information

***Ellipsaria* – Volume 2, Number 2 – August 2000**

Editor

Christine Mayer
Illinois Natural History Survey
607 E. Peabody Dr.
Champaign, IL 61820

***Ellipsaria* Editorial Review Board**

Mark Hove
University of Minnesota
Department of Fisheries
1980 Folwell Ave.
St. Paul, MN

Paul D. Johnson
Southeast Aquatic Research Institute
5385 Red Clay Road
Cohutta, GA 30710

Kevin J. Roe
University of Alabama
Department of Biology
Collections Building
Tuscaloosa, AL 35487

Bob Szafoni
IL DNR
1600 W. Polk Ave.
Charleston, IL 61920

Rita Villella
USGS-BRD
Leetown Science Center
Kearneysville, WV 25430

G. Thomas Watters
Ohio State University
1315 Kinnear Road
Columbus OH, 43212

Freshwater Mollusk Conservation Society Officers for 2000 - 2001

President

Paul D. Johnson
Southeast Aquatic Research Institute
5385 Red Clay Road
Cohutta, GA 30710
(706) 694-4419 Fax: 5739
pdj@sari.org

President Elect

Kevin S. Cummings
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, IL 61820
(217) 333-1623 Fax: 4949
ksc@inhs.uiuc.edu

Secretary

Rita Villella
US Geological Survey
Leetown Science Center
Kearneysville, WV 25430
(304) 724-4472 Fax: 4465
rita_villella@usgs.gov

Treasurer

Heidi L. Dunn
Ecological Specialists Inc.
114 Algana Court
St. Peters, MO 63376
(636) 447-5355 Fax: 4101
ecologists@aol.com

Past President

Alan C. Buchanan
Missouri Dept. of Conservation
1110 S. College Avenue
Columbia, MO 65201
(573) 882-9880 Fax: 4517
buchaa@mail.conservaion.state.mo.us

Executive Assistant

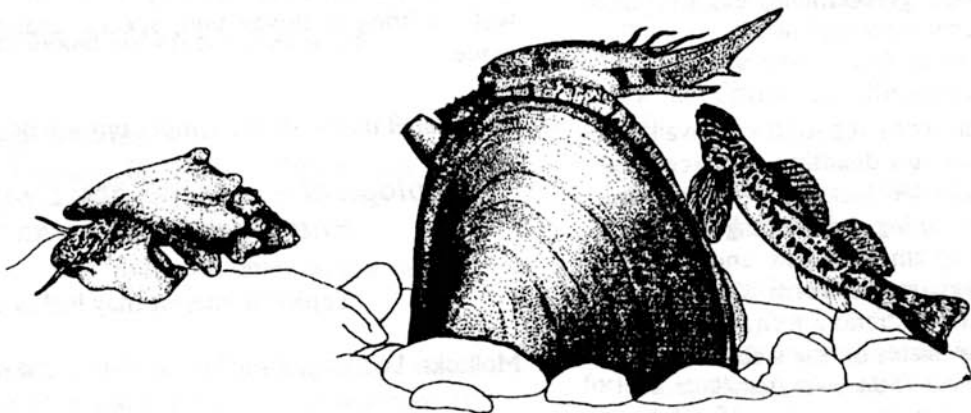
Steve A. Ahlstedt
US Geological Survey
1820 Midpark Drive
Knoxville, TN 37828
(865) 545-4140 Fax: 4496
ahlstedt@usgs.gov

Ellipsaria - Volume 2 - No. 2 - Summer 2000

Table of Contents

FMCS 2001 Symposium Information - First Call For Papers	2
FMCS April 3, 2000 Board Meeting Minutes	3
FMCS June 6, 2000 Board Meeting Minutes	7
Next FMCS Board Meeting and call for 2001 officer nominations	8
Submitted Reports	9
1999 FMCS Freshwater Mollusk Bibliography	17
FMCS Membership Roster	33

Freshwater Mollusk Conservation Society



FMCS 2001 Symposium
March 12 - 14, 2001 DoubleTree Hotel
Pittsburgh, Pennsylvania

The Pennsylvania Department of Environmental Protection is pleased to host the 2001 Symposium of the Freshwater Mollusk Conservation Society in Pittsburgh. We are excited about the potential of the special session dealing with river projects and the effects mussel and snail resources have on their design and implementation. When conservationists, developers and industry work together in a proactive manner during the early phases of projects, preservation of valuable resources, the protection of rare species and successful project implementation can result. The program also includes timely talks from renowned researchers and provides a unique opportunity for mollusk scientists to exchange information. Pittsburgh has much to offer participants. The city is excited about the two new sports stadiums that will open in 2001, and the expansion of the Convention Center. The Downtown area has numerous restaurants, bars and clubs. We hope you will join us for an exciting time, both intellectually and recreationally.

Program

FMCS 2001 will feature both invited and contributed sessions dealing with a wide variety of mollusk topics. The plenary session will feature a talk by Gerry Mackie on the Sphaeriidae; Dan Brooks will speak on data needs for developing phylogenies; and tentatively Harold Silverman will discuss mussel feeding. Contributed papers and posters are solicited on any topic dealing with freshwater mollusks. Format requirements for contributed papers are given in the Author Information section (below).

Special Session

On Monday, March 12 a special session will be held dealing with the impact of mussel resources on river projects and how to resolve existing and potential problems. Presentations will provide examples and solutions. Panel discussions will address issues of planning, sampling protocols, translocation, mitigation and jeopardy. Various state and federal agencies and private industry have already committed to participate, including PennDOT, USFWS, USGS, TVA, USACE, gravel mining industry, and commercial shell harvesters.

Registration

At the current time only hard copy registration is available. Please note the **early registration deadline of December 15, 2000**. The registration fee includes beverages and snacks for breaks and mixers during the meeting and lunch on 2 days, along with program materials and meeting souvenirs. A symposium **registration form** is enclosed in this newsletter. Additional registration forms and other symposium information are available on the web at:
www.dep.state.pa.us/dep/deputate/fieldops/sw/tom/fmcs.html

Accommodations

The DoubleTree hotel special meeting rate is \$89.00 per night single or double occupancy. These rates are below the current Federal allowance for Pittsburgh. Contact the hotel directly at (412) 281-3700 for reservations. The FMCS is not responsible for symposium attendees room reservations.

Travel

The official airline for the Conference is US AIRWAYS. They provide nonstop flights to Pittsburgh from many locations throughout the United States. They have provided attendees with a substantial discount. Fares are 5% off the lowest applicable fare, or 10% for 60 day advanced purchase. These rates are applicable for the period March 8 - March 17, and do not require Saturday stay. To obtain these rates be sure to provide your travel agent with the Gold File Number 65651533. Reservations can also be made directly with US AIRWAYS at (877) 874-7687 using the same file number.

The DoubleTree Hotel operates a bus shuttle from the Airport directly to the hotel for \$12.00 one way or \$21.00 roundtrip.

Car rentals will be unnecessary, as all scheduled symposium activities will be held at the DoubleTree Hotel. Numerous restaurants and bars are adjacent to the hotel. The Pittsburgh subway provides access to the entire downtown area for free. The subway fare to locales outside the downtown area is \$1.00.

Parking at the hotel is \$15.00 per day for valet service, which provides in and out privileges, or \$10.00 per day for self-parking. Outside parking lots range in price from \$5.00 to 8.50 per day.

Instructions for Authors - First Call for Papers

The symposium program format will be both oral and poster. Oral presentation time is limited to 20 minutes (including the question and answer period). Practice your talk before the meeting because **time limits will be strictly enforced** (lights on - microphone off). Poster size is limited to 8 feet wide by 4 feet tall, although if you wish to bring a display unit, special arrangements can be made.

The overall theme of the symposium will be:

***"Biological Assessments: Evaluation of
Endangered Mollusks"***

Topics of interest may include:

Mollusks: Locating, sampling, analyzing and relocating

Development: Project examples, problems, solutions

Coordination: Public-private relationships, agency cooperation, regulations

In addition to the special sessions contributions dealing with the biology, life history, ecology, distribution, taxonomy, genetics, rearing, feeding strategies, environmental requirements, invasive species impacts, and fish-host relationships are also planned.

Video playback equipment will be available for the sessions. At the bottom of your abstract please indicate if your presentation is oral or poster. Also indicate the type of audio video equipment you will require for your presentation. Video monitors will not be provided for the poster session.

All Abstracts must be received by **December 15, 2000**. Authors will be notified of acceptance by January 15, 2001. In the event of a large number of abstracts is received, the symposium organizers reserve the right to assign oral abstracts to a poster session, with the authors consent. Abstracts must be submitted on 3.5 inch diskettes, in PC Word, WordPerfect or ASCII format or emailed similarly to tproch@stargate.net by the deadline.

Abstracts should be mailed to:

Tom Proch, PA Dept. of Environmental Protection,
2721 Cedric Avenue, Pittsburgh, PA 15226. Phone
(412) 442-4051, Fax (412) 442-4328, e-mail:
tproch@stargate.net

All abstracts must adhere to the following guidelines and include:

1. Title, author(s) names, presenter if more than one author, address, phone, email address, of contact person, and keywords.
2. Clear summary of presentation including objectives, results and conclusions.
3. Indicate type of presentation, whether poster or oral.
4. Total abstract should not exceed 300 words.

Presentation requirements

Not to exceed 20 minutes (15 minutes for talk and 5 minutes for questions and discussion).

Slides and LCD projector visual aids only (no overheads).

Posters requirements

The poster should be readable from 5 feet, titles from 10

Poster should not exceed a size of 4 feet high by 8 feet wide.

Authors must be present at the poster session from 7:00 to 9:00 p.m. on Tuesday, March 16, 2001.

The following abstract, from the 1999 Chattanooga FMCS symposium, is presented here as an illustration of the proper format.

SAMPLE ABSTRACT

HOST IDENTIFICATION STUDIES FOR SIX SPECIES OF UNIONIDAE. G. T. Watters, S. W. Chordas, S. H. O'Dee & J. Reiger. Ohio Biological Survey & Aquatic Ecology Laboratory, Ohio State University, 1315 Kinnear Road, Columbus, OH 43212. gwatters@postbox.acs.ohio-state.edu & odee.2@postbox.acs.ohio-state.edu

Host identification studies were performed under laboratory conditions for 6 Unionidae species. Potential hosts were infected with glochidia by either feeding them conglutinants, submersing them in aerated buckets containing a glochidial suspension, or pipetting glochidia directly on the gills. Three species (Silverjaw Minnow, Longnose Dace, and Common Shiner) were identified as hosts for *Obliquaria reflexa*. Five species (Largemouth Bass, Longnose Dace, Pumpkinseed, Banded Darter, and Northern Hogsucker) were identified as hosts for *Lasmigona costata*. Six species were found to be hosts for both *Strophitus undulatus undulatus* (Banded Darter, Bluntnose Minnow, Sand Shiner, White Crappie, Longnose Dace, and Fantail Darter) and the federally endangered *Epioblasma obliquata obliquata* (Blackside Darter, Rock Bass, Logperch, Greenside Darter, Stonecat, and Mottled Sculpin). Eleven species (Fantail & Blackside Darters, Spotfin & Common Shiners, Largemouth Bass, Pumpkinseed, Slimy Sculpin, Fallfish, Northern Hogsucker, Rosyface Minnow, and Central Stoneroller) were identified as hosts for *Alasmidonta undulatus*. Thirteen species (Largemouth & Rock Bass, Sand & Spotfin Shiners, Bluegill, White Crappie, Logperch, Pumpkinseed, Banded Darter, Bluntnose Minnow, White Sucker, and the exotic Siamese Fighting Fish and Blue Gourami) were found to be hosts for *Lampsilis reeviana brevicula*.

**FMCS Board Meeting Minutes
and Committee Reports**

The last full meeting of the FMCS Board was held on April 3, 2000 at the USFWS National Conservation and Training Center in Kearneysville, West Virginia. Progress from the previous board meeting held November 3-4, 1999 in Crittenden, Kentucky were accepted by the board.

1. A letter from the society outlining the concerns with black carp was mailed.

2. The outreach workshop agenda was finalized and the date set for April 4-5 at the National Conservation Training Center in Shepherdstown, WV. The society paid for the production of 200 hats with the FMCS logo at a cost of \$7.25 a piece and will be sold for \$10.00 each.

3. A certificate of appreciation from FMCS was made for each of the following individuals: John Jenkinson, Dick Biggins, Tom Muir, as former committee chairs.

Treasurers Report:

The total assets of the society are \$14,024.84. Income from dues from January through March was \$4,240.00 and the workshop generated \$5,810.00 for a gross profit of \$10,050.00. Total expenses through March were \$1,000.00 for a net profit of \$9,050.00. Retained earnings from last year totaled \$4,974.84. There are 148 members that have paid dues for the current year.

There is approximately \$17,000 in the symposium account, but the proceedings still need to be published with an estimated cost between \$8,000 - \$10,000. The remaining funds will be transferred to Tom Proch for the 2001 symposium in Pittsburgh.

The 501(c)(3) form has been filed and the society has a corporation number. The board decided to move the FMCS funds from the general business account to an interest bearing account. Treasurer Dunn will begin to investigate our options, looking at certificate of deposits, money markets, etc. and report back to the board in November. The board needs to consider the funding goal, including funding for awards, proceedings and publishing of a journal that will affect funds needed by the society. The board agreed we need to increase the membership to at least 200 before the society begins considering having funds available to the membership to use for awards, grants, etc. It was agreed the board needs to determine the society priority actions then the funding goal. Heidi will investigate the establishment of a credit card account that will allow participants to register online for the upcoming symposium. A motion was carried to accept the treasurers report.

Outreach Workshop Update:

FMCS paid for the reception, lunch and breaks at the workshop, and 200 hats for a total cost of about \$2,500. The Fish and Wildlife Service paid for 75 outreach workbooks at \$13.00 each.

Kurt Welke wrote a letter to Wayne Davis and the UMRCC to thank them for their contribution to the outreach workshop. Both UMRCC (Upper Mississippi River Conservation Committee) and MMT (Mussel Mitigation Trust) contributed \$2000 apiece. We are expecting \$500 from TWRA (Tennessee Wildlife Resources Agency), \$500 from MICRA, and \$1000 from TVA (Tennessee Valley Authority). These contributions resulted in the generation of over \$6,000 from the April workshop after expenses.

Committee Reports

Outreach Committee:

The board agreed that the society needs to develop a display that can be taken to various meetings and conferences. The board decided that 2-3 people from the outreach committee will be given the responsibility to develop a display with associated costs. Kurt Welke volunteered to participate, Paul Johnson offered to help as well as Al Buchanan. The board also decided there should be two objectives for the outreach committee this year: a display targeting AFS 2000 and a long-term general display on freshwater mollusks. Kurt Welke will take the lead on the display targeting AFS and Paul Johnson will help since he is working on a tri-fold brochure.

Symposium Committee:

The 2001 symposium will be held at the Doubletree Hotel in Pittsburgh, PA from March 12 - 14 with a Sunday arrival and the talks held Monday through Wednesday. Tom Proch is the local events coordinator. Tom has looked at external funding support and seems to have things well in hand. Paul sent the list of criteria for FMCS symposia and Tom, hopefully helping the process. Over a third of the registration at Chattanooga was on line so there is a need for this capability for future symposia. As mentioned, a hotel can do that for us but for a fee. So should FMCS set up a society web page, get a credit card account so we can do this ourselves? Tom should have about \$7,000 and \$8,000 to use from the symposium account. The plenary session may focus on river navigation and habitat alteration and their effects on the freshwater fauna. There will not be concurrent sessions unless needed. The author session for the poster session will not be concurrent with other presentations.

Additionally, there was concern attendance may drop if the meetings were held annually. If the society holds workshops we may want to consider holding 2 workshops at the same time (2 topics) to increase attendance. The motion was carried that a symposium be held every other year with workshops held in even years and symposium in odd years. The motion carried with the understanding this topic could be revisited at a later date. John Alderman presented an update on the arrangements for the symposium to be held in North Carolina in 2003. Current options for facilities have some logistics problems. Other options were discussed, such as Charlotte, however airfares are more expensive, the same with Asheville. The 2003 symposium will be held in North Carolina, but a specific location and date will be determined at the next board meeting.

Symposium Proceedings: There were 3 points of discussion on this issue: 1) They are too expensive, even though state folks may use this as an avenue to publish; 2) we may want to consider the long abstract format but this probably will still be too expensive; and 3) we can let the program guide of abstracts be the record of the meeting, similar to other societies. In light of these arguments against a proceeding

It was decided that no proceedings would be planned for Pittsburgh or any other venue in the near future. The motion was made and carried to no longer publish a proceedings. For the time being the newsletter will be the major product of the society.

Workshop Topics:

Ideas for the next workshop were discussed: conservation genetics (Dave Berg willing to host) and a propagation/habitat requirement workshop. The propagation would be focused on hatcheries. It was mentioned the USFWS will dictate about 20% of their budget towards the propagation of imperiled species. There was also mention of a habitat preservation workshop. After some discussion the board felt that a hands on propagation workshop should be combined with conservation genetics. The motion was made and carried to charge the propagation committee to organize a propagation workshop in 2002 but the curricula should also include attention to related issues such as conservation genetics and habitat restoration.

Editorial ad hoc Committee:

The tentative offer of J. B. Burch to let the society develop *Walkerana* as it's official journal will be investigated. Because of the irregular nature of many other malacological publications, this is of keen interest to the society. *Walkerana* is seen as a potential publication format that would cover all topics of molluscan biology. Tom Watters and Kevin Cummings plan to meet with J. B. Burch in Michigan to discuss this issue next summer or fall.

Status of Unionids Atlas Committee:

The committee received about \$2,000 dollars from Dick Biggins to develop 5-6 species accounts to see what the final product will look like. What the committee is lacking are funds to pay for the production of individual species accounts. One possibility is CARA funds from states, or possibly submit a proposal to NSF. Kevin will distribute database instructions to those that volunteered to help with the first few accounts. The Nature Conservancy is launching a nationwide effort to develop a biodiversity database, broken up by ecoregions on insects, mollusks, and fish. Their goal is to target high diversity sites within each state. When completed late next year this database may be useful to the atlas projects.

Status of Gastropods Committee:

There are 75 people who have expressed interest on the status of snail project. The initial project proposal was submitted to NSF in November. Phase one is a museum survey of 22 national museums to determine what records are available and to develop a database for a cost of \$650,000.00 for this phase. The proposal obligates the society to maintain this database - proposal includes a server and personnel to run the database. FMCS would serve as a clearinghouse for this information. The plan is to

start with the most modern records and go back to around 1950. Phase 2 will be field surveys. Phase 3 will be the monographic phase - web products and a series of volumes. It was agreed the two Atlas committees should stay in contact on database structure.

Information/Exchange Committee:

This committee is in need of a new chair. Website: Kevin Cummings, Tom Watters, Art Bogan and Chris Mayer submitted a proposal to the fish and wildlife foundation mussel conservation fund, and part of this proposal included a server to host the FMCS website. However, the url would be required to have the university uiuc.edu tag. Unfortunately fmcs.org is already taken as a url so this is not an issue. The board recommended the information exchange committee come up with the format and guidelines for the web page, including what materials and information should be on the website. Kevin volunteered to head up this effort. Mark Hove volunteered to assist with putting together the FMCS webpage. The board recommended that Paul send a letter to the committee chairs to send to Kevin what they would like to see on the webpage as a way to start this effort.

Ellipsaria Production:

There was discussion as to how many times a year to publish and distribute the newsletter. Paul suggested the newsletter stay within the information/exchange committee and become their primary charge. The newsletter becomes the primary FMCS product until a decision is reached about the journal. The committee needs to select an editor and an editorial committee to improve the quality of the newsletter. Submission guidelines and policies need to be developed. Chris Mayer has volunteered to serve as the newsletter editor. It currently costs about \$800 to produce and mail a single issue. There was some discussion to investigate having members have the option to receive the newsletter online. Chris Mayer will be charged with developing questions and issues that need to be addressed and work with the information exchange committee to develop newsletter recommendations and guidelines and present them to the board.

Water Quality/Habitat/Zebra Mussel Committee:

Bob Anderson talked with Tom Muir to get his ideas on goals for the committee. There are still several water quality papers that have not been published in NABS. Tom and Bob will work together to write a synopsis of these papers and Bob will be meeting with Tom in a few weeks. The board felt that a worthwhile product would be to publish all of the water quality papers, with the synopsis preceding, as an FMCS product. The board charged this activity to the committee. The committee will need permission from NABS to reprint the 4 that have already been published. The board recommended that Bob first contact Dave Strayer for guidance.

Total income 2000	9,875.75
Cash on hand 1-1-2000	4,974.84
Total in account	14,850.59

The society received official notification of our non-profit 501 (c) 3 status as of June 30, 2000.

Report submitted by Heidi Dunn.

Next FMCS Board Meeting Set

The next meeting of the FMCS board will occur on November 2 - 3, 2000 at the DoubleTree Hotel in Pittsburgh, PA (for room reservations call: (412) 281-3700). The meeting will begin at 1:00 p.m. on Thursday, November 2 and continue until noon the following day. The FMCS board meeting will follow the Ohio River Valley Ecosystem - Mussel Committee meeting which will also be held at the DoubleTree Hotel. Please contact Karl Duncan of the USFWS, at 703/358-2464 for more information about the ORVE mussel meeting.

FMCS board meetings are open and any society member may attend. However, only officers and committee chairs are allowed to vote. Items on the tentative agenda for the next board meeting will be:

- Preparations for the Pittsburgh symposium
- 2002 workshop curricula and site location selection
- Final site selection for the 2003 symposium in North Carolina
- Long term financial planning for society revenues
- Discussion of criteria for student travel awards and meritorious service awards
- Recommendations for the improvement and further development of *Ellipsaria* and its editorial board
- Initial report and discussion about the details of *Walkerana* as the official society journal
- Further official action on the Black Carp issue
- Defining of the basic committee duties for each committee chair.

All board members and interested members are encouraged to attend.

Respectfully,
Paul Johnson, FMCS President

Nominations Requested for 2001 FMCS Officer Elections

The FMCS is now seeking nominations from the membership for the offices of:

President-elect 2001 and Secretary

The office of president-elect is a one-year term before the individual becomes society president. After the year as society president, the individual must then serve an additional one-year term as past president, for a total of 3 years of service to the board.

The society secretary is elected to a 2-year term. After the first term, the society Secretary may be re-elected for one additional term if desired (2 consecutive terms of 4 years). For example the current FMCS Secretary (Rita Villella) is eligible for one additional term.

The change in officers will occur at the end of the business meeting at the FMCS Pittsburgh Symposium in March 2001.

Our constitution stipulates that any member can nominate another member for office, and those individuals with the most nominations from the membership, and who agree to be nominated, become an official candidate. The names of the nominees are placed on a ballot and are then directly elected by the society membership. The ballot for the 2001 elections will appear in the Fall 2000 issue of the newsletter.

Please send your nominations for 2001 officers to:

Leroy Koch, USFWS
265 Bogey Drive
Abingdon, VA 24211
Phone (540) 623-1233
e-mail leroy_koch@fws.gov

The deadline for FMCS 2001 officer nominations is October 27, 2000

CONSTITUTIONAL RESOLUTION OF THE FRESHWATER MOLLUSK CONSERVATION SOCIETY

The following article was proposed during the June 16, 2000, meeting via conference call. In order to bring more stability to the FMCS committee chairs and the board of directors. The resolution was made by the president, and accepted by the other board members. This changed the terms of committee chair service, from 1 to 2 years, and the chairs will be elected by participants in each committee

at the symposium. Pending membership approval at the next members business meeting this new resolution will begin with at the 2001 Pittsburgh symposium.

BE IT RESOLVED on a vote of the Society membership was called during the annual meeting held for the purpose of amending the ByLaws, Article V paragraph 5.2 from its present form to allow for election of committee chairs every other year at the Society Symposium.

Article V shall hereafter read as follows:

ARTICLE V - BOARD OF DIRECTORS

5.2 Qualifications and Number of Directors. The number of Directors may be increased or decreased, but to no fewer than three, from time to time by amendment to the Articles or By-laws. A Director must be a member in good standing.

The Board of Directors shall consist of the President as the presiding officer, the President-Elect, Secretary, Treasurer, and Chairs of Standing Committees as defined in the By-laws. Chairs of Standing Committee are to be selected by members of that committee every other year at the Society Symposium. A committee may have co-chairs but only one vote on the Board of Directors. A person may be Chair of only one Standing Committee at any given time.

The Board of Directors shall determine the number, times and places of full Society meetings.

The first slate of officers will be selected by the Board of Directors.

This amendment to the Bylaws was approved and adopted on June 19, 2000.

Additional News about the FMCS Gastropod Status and Distribution Committee

Rob Dillon, Chair - Dept. of Biology, College of Charleston, Charleston, SC 29424, e-mail: dillonr@cofc.edu

The Freshwater Gastropods of North America project now has a roster of 86 names. Phase I of the project, our survey and compilation of all modern museum collections and distributional records, is moving ahead. In May we called for example databases, and through June we have received responses from about ten museums and state agencies. Dr. George Pothering, of the College of Charleston's Computer Science Department, has been busy unifying the diverse formats and structures, and we hope to have a combined database available online soon. EWGNA

phases II (field survey) and III (monography) remain on the distant horizon.

Keep our website bookmarked:

<http://www.cofc.edu/~dillonr/fwgnahome.htm>

First FMCS Workshop Well Attended

The very first workshop held by FMCS last April 4 - 5, 2000 at the USFWS National Conservation and Training Center in Shepherdstown, West Virginia was a success. The workshop attracted 52 participants from 16 different states. This program focused on techniques of community outreach for watershed protection and restoration. Over 20 speakers participated in the program (both presentations and panel discussions. Special thanks go out to Linda Drees, Susan Mangin, Kurt Welke, and Rita Vilella for all of their hard work in developing the workshop program. The FMCS would also like to thank the USFWS, USGS, Tennessee Wildlife Resources Agency (TWRA), TVA, UMRCC and Mussel Mitigation Trust (MMT) for their generous sponsorship of the meeting.

The FMCS hopes the Outreach workshop is only the first of many successful workshops to come in the future. In the works for the spring of 2002 is a program that will focus on the propagation, genetics, and habitat requirements of freshwater mussels. Further details about this program should be available by the symposium.

Contributed Articles

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

Notice of Construction Work at the Ohio State University Museum of Zoology

YOU ARE ALWAYS WELCOME BUT. . .

Now is not the time to use the unionid research collections at the Museum of Biological Diversity at the Ohio State University. The Museum building is getting a new roof and the entire catalogued collection, cabinets, shelved jars, boxed lots, etc. are wrapped in plastic. Hopefully the plastic will prevent damage, but it is a little disconcerting to stand amid the shrouded cabinets, look up and see the clouds passing across the open sky overhead.

We'll let you know when we are fully functional again--hopefully before the snow flies!

Sincerely,

Black Carp - The Cyprinid Darth Vader

Kevin S. Cummings
Research Scientist
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, IL 61820
ksc@inhs.uiuc.edu
<http://www.inhs.uiuc.edu/cbd/collections/mollusk.html>

The black carp (*Mylopharyngodon piceus*) is a large (up to a meter in length) molluscivore that has been imported from Asia into North America by the aquaculture industry. Black carp were first introduced into the U.S. in the early 1970s as a "contaminant" in imported grass carp stocks. The second introduction came in the 1980s when the species was imported as a food fish, and as a biological control agent to combat the spread of yellow grubs in aquaculture ponds. Nico and Williams (1996) reported that Arkansas, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma and Texas were known to have black carp in aquaculture farms and research facilities. Four other Asian carp species (common, grass, bighead, and silver carps) have been introduced into U.S. waters, and all have been able to establish themselves in the wild, producing large populations. The large numbers of Asian carp that presently occur in certain parts of the Mississippi River Basin undoubtedly are producing significant negative impacts on native fish species. However, the black carp poses an even greater threat to native invertebrate populations because it feeds almost exclusively on mollusks which are the most endangered group of animals in North America, with over 70% of our native freshwater mollusk species in need of conservation.

In the fall of 1999 the state of Mississippi decided to allow fish farmers to import reproductively viable (diploid) black carp from Arkansas to control snail populations (*Planorbella trivolvis* and *P. subcrenata*) which serve as an intermediate host to the digentic trematode *Bolbophorus confusus* (often called "grubs" or "flukes") in their catfish ponds. This raised a significant "red flag" with other states in the Mississippi River Basin and throughout eastern North America. Of great concern is the fact that 90% (191 species) of the native mussel species designated as endangered, threatened, or of special concern by the AFS (Williams et al. 1993) are found in the southeastern states - not far from where the black carp are being stocked. Forty-eight percent or 102 of these species are endemic to that region of the U.S., and the black carp have the potential of driving some of these species to extinction. Black carp also could have a profound negative effect on native fingernail clam populations which serve as a primary food source for many migratory waterfowl species in the Mississippi flyway and elsewhere.

On 24 February 2000 the Mississippi Interstate Cooperative Resource Association (MICRA) petitioned Jamie Rappaport Clark, Director of the U.S. Fish & Wildlife Service (USFWS), to list the black carp as an "injurious species of wildlife" coming under jurisdiction of the Federal Lacey Act. The USFWS published a notice regarding the black carp in the Federal Register on June 2, 2000 (Proposed Rules Vol. 65(107):35314-35315. Federal Register Online: wals.access.gpo.gov, DOCID:fr02jn00-23). The U.S. Fish and Wildlife Service is reviewing available economic and biological information on the black carp for possible addition to the list of injurious wildlife under the Lacey Act. The importation and introduction of *M. piceus* into the natural ecosystem of the United States may pose a threat to native mollusk and fish populations. Listing *M. piceus* as injurious would prohibit its importation into, or transportation between, the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any territory or possession of the United States, with limited exceptions. The Federal Register notice seeks comments from the public to aid in determining if a proposed rule is warranted.

The Federal Register notice also solicited economic, biologic, or other information concerning *M. piceus*. The information will be used to determine if the species is a threat, or potential threat, to those interests of the United States delineated above, and thus warrants addition to the list of injurious wildlife in 50 CFR 16.13. The information will also assist USFWS in preparing impact analyses and examining alternative protective measures under the Regulatory Flexibility Act (5 U.S.C. 601).

The Lacey Act (18 U.S.C. 42) and implementing regulation in 50 CFR part 16 restrict the importation into or the transportation of live wildlife or eggs thereof between the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any territory or possession of the United States of any nonindigenous species of wildlife determined to be injurious or potentially injurious to certain interests, including those of agriculture, horticulture, forestry, the health and welfare of human beings, and the welfare and survival of wildlife and wildlife resources in the United States. However, injurious wildlife may be imported by permit for zoological, educational, medical, or scientific purposes in accordance with permit regulations at 50 CFR 16.22, or by Federal agencies without a permit solely for their own use. If the process initiated by this notice results in the addition of *M. piceus* to the list of injurious wildlife contained in 50 CFR part 16, their importation into the United States would be prohibited except under the conditions, and for the purposes, described above.

The Freshwater Mollusk Conservation Society, American Malacological Society, American Fisheries Society and other organizations have called for the elimination of all

black carp stocks in North America. A risk assessment conducted by the U.S. Geological Survey, Biological Resources Division concluded that the risk to native mollusks posed by the black carp was high (Nico & Williams 1996). There is ample biological evidence to justify preventing black carp from being used anywhere in the U.S. for any purpose. However, the final decision on this matter, and therefore on the ultimate fate of the North American native mollusk fauna will be made by the USFWS. Those who support the use of black carp are busy lobbying their Congressmen and USFWS to protect their perceived right to continue that use. Those who oppose the use of black carp will have to do the same.

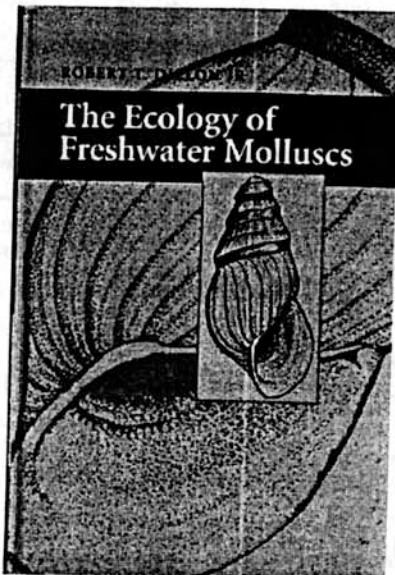
FOR FURTHER INFORMATION CONTACT: Susan Mangin, Division of Fish and Wildlife Management Assistance at (703) 358-1718 or Kevin Cummings, Illinois Natural History Survey, ksc@inhs.uiuc.edu.

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Nico, L.G., and J.D. Williams. 1996. Risk assessment on black carp (*Pisces Cyprinidae*). Final Report to the Risk Assessment and Management Committee of the Aquatic Nuisance Species Task Force. U.S. Geological Survey, Biological Resources Division, Gainesville, Florida.

Other News from Rob Dillon



Rob Dillon has a new book which is now available from Cambridge University Press (ISBN 0 521 35210) and it

retails for \$110.00. Despite its high cost the book is a very comprehensive volume assessing many different ecological aspects of freshwater mollusks and is well worth the cost. Rob would appreciate your purchasing the book, so his wife will know it was well worth the 10 years of effort he spent writing it ☺ !. Seriously, it is a fabulous book, extremely well thought out, organized and written. I highly recommend the book to anyone interested in the biology and ecology of freshwater mollusks. Besides, the cover art on the book is a fantastic reprint of J. L. Tottenham's plate of *Elimia proxima* (Sorry Rob, I couldn't resist!).

Very respectfully submitted by P. Johnson

Minnesota Announces a Statewide Freshwater Mussel Inventory

Daniel E. Kelner, Minnesota Department of Natural Resources, Division of Ecological Services, 500 Lafayette Rd., St. Paul, MN 55155-4025, (651) 282-2509, dan.kelner@dnr.state.mn.us
http://www.dnr.state.mn.us/ecological_services/nhnrp/mussels/nativemussels.html

Freshwater mussels are one of the most imperiled group of animals in North America yet we know their status in relatively few of Minnesota's approximately 80 river systems. In response, we initiated the first ever statewide freshwater mussel survey of these river systems in 1999. We expect that it will take six years to complete. Minnesota's freshwaters are significant because they encompass three major drainage systems: the Mississippi, the St. Lawrence, and Hudson Bay. Each of these drainages support unique mussel communities. Historically, forty-eight species (two presumed extirpated) have been identified. A qualitative sampling approach using timed visual and tactual searches allows us to define the distribution of species, compare the present and historic fauna, and determine species richness, abundance, and demographics. To date twelve rivers and approximately 50 tributaries have been surveyed completing two subsystems of the Mississippi River drainage; the Missouri and the St. Croix. Work is currently underway on a third subsystem; the Minnesota River drainage. Survey work has also been completed on tributaries which enter the Mississippi River below the Minnesota border, on one tributary of the Red River (Hudson Bay), and has been initiated on Pools 1, 2, and 3 of the Mississippi River. Surveys in the southern third of the state showed most streams no longer support their historic complement of mussel species, probably due to altered hydrology, poor water quality and habitat degradation. In contrast, tributaries of the St. Croix River supported healthy mussel communities of up to 25 live species, indicating sustained quality of the system probably due to less intensive agricultural and urban activities.

The mussel fauna in Pool 2 of the Mississippi River, reportedly decimated by the 1970s, appears to be re-establishing following improved water quality conditions over the past 15 years. Twenty species were found live, most of which were dominated by young individuals. Zebra mussel infestation is very low (< 1%) in Pools 2 and 3 and absent in Pool 1.

Acknowledgment: Mike Davis and Rick A. Hart (MN DNR) also participate with the survey.

Quantitative Assessment of Freshwater Mussels in the Sydenham River Ontario

J. Di Maio¹, J.L. Metcalfe-Smith¹, and P.S. Pooler².

¹National Water Research Institute, P.O. Box 5050, 867 Lakeshore Road, Burlington, Ontario, Canada L7R 4A6.

²USGS - Biological Resources Division, Aquatic Ecology Laboratory, 1700 Leetown Road, Kearneysville, WV, USA 25443

The Sydenham River is one of the richest rivers for freshwater mussels in the Great Lakes region, currently sustaining 30 species. The river supports two nationally endangered mussels, the northern riffleshell (*Epioblasma torulosa rangiana*) and rayed bean (*Villosa fabalis*). Land use in the watershed is predominantly agricultural and there are concerns that these activities are increasing. Our goal was to determine the demographics of the healthiest remaining communities in the system to use as recovery targets.

Two sites in the most productive reach were sampled for mussels using a systematic sampling design. Areas of 345m² at the upstream site (SR-3) and 390m² at the downstream site (SR-12) were divided into 15m² blocks, and three 1m² quadrats were sampled in each block. Sampling coverage at both sites was 20% of the total area. Quadrats were excavated to a depth of about 5 to 10cm and habitat features measured.

Although the Sydenham River supports the most diverse mussel community of any river in Ontario, mussel densities appear to be moderate. We found 230 mussels representing 20 species at SR-3 and 235 mussels of 19 species at SR-12. Densities were similar (3.33 ± 0.78 and 3.01 ± 0.56 mussels/m², respectively), but species composition differed between sites. *Lasmigona costata* was the most common species at SR-3, occurring in 54% of the quadrats, whereas *Actinonaias ligamentina* was the most common species at SR-12, occurring in 42% of the quadrats. Quadrat surveys allowed us to generate density estimates for some of our provincially and nationally rare species. Density of the northern riffleshell at SR-3 (0.246/m²) was comparable to that reported for the healthiest remaining populations in North America.

A comparison of survey results with earlier timed searches revealed that, on a CPUE basis, timed searches detected more species but fewer individuals than quadrat sampling. We attribute this difference to the fact that a larger area was sampled during timed searches, likely covering a wider variety of habitats. For both sites, the average size of mussels collected during quadrat surveys was smaller than that of timed searches. Our analysis revealed the benefits of excavating since we were able to find more smaller animals, some of which were juveniles.

There were associations between some habitat variables (e.g., depth, substrate) and the diversity and abundance of mussels. We found low abundance and diversity in quadrats with poor conditions, but in quadrats with good conditions, a large range of abundance and diversity was observed. Therefore, it could be predicted where mussels would not be, but optimal conditions did not guarantee that mussels would thrive in a particular area.

Higgins Eye Recovery Effort Underway

Kurt Welke, WI DNR (608) 273-5946, Pam Thiel, USFWS (608) 783-8431, or Todd Turner, Genoa NFH (608) 689-2605.

Efforts to recovery the Federally endangered Higgins Eye mussel (*Lampsilis higginsii*, Lea, 1857) in the Upper Mississippi River (UMR) basin are moving along well. A joint propagation, culture, and transplant effort between the Wisconsin DNR and the USFWS is addressing the threat from the zebra mussel to this species with support from numerous partners. Working with grant moneys received from restitution paid into the Fish and Wildlife Foundation Freshwater Mussel Conservation Fund, upgrades were made at the Genoa National Fish Hatchery to facilitate fish infection, holding, and transformation. Gravid females were collected from the St. Croix River in early May 2000. Glochidia were harvested from 4 Higgins Eye and used to infect 2, 600 (qty) fish lots of walleye and largemouth bass. A subsample of 100 of each fish species was held in aquariums to document transformation time, initial survival, and recovery rates. At the end of 60 days, we estimated a minimum of 50,000 transformed juveniles that have either dropped into raceway substrates, or have been transferred from aquarium siphonate to culturing treatments in the hatchery. We have experienced what appears to have been a major attrition event between days 47 and 65, post transformation. Current survival estimates from counts made from treatments are in the 30-40% range. Surviving mussels have approximately tripled in size, with size at day 70 exceeding 500 microns for many individuals. 2500+ juvenile mussels have been planted out into the Lower Wisconsin River (LWR) into screened trays placed within mussel habitat. Additional plantings are planned for late July 2000. Mussels remaining in hatchery raceways and treatments will be quantified in late fall 2000.

New Publications from Chuck Lydeard's Laboratory

Biodiversity & Systematics, University of Alabama, Dept. Biological Sciences, Box 870345, Tuscaloosa, Alabama 35487
clydeard@bsc.as.ua.edu

- 1) Lydeard, C., W. E. Holznagel, M. N. Schnare, and R. R. Gutell. 2000. Phylogenetic Analysis of Molluscan Mitochondrial LSU rDNA Sequences and Secondary Structures. *Molecular Phylogenetics and Evolution* 15:83-102.
- 2) Holznagel, W. E., and C. Lydeard. 2000. A molecular phylogeny of North American Pleuroceridae (Gastropoda: Cerithioidea). *Journal of Molluscan Studies* 66:233-257.

The following publication is a checklist of Alabama unionids including their conservation status.

- 3) Lydeard, C., J. T. Garner, P. Hartfield, and J. D. Williams. 1999. Freshwater mussels in the Gulf region: Alabama. *Gulf of Mexico Science* 1999(2):125-134.

Recent Publications from David Strayer

Reprints of the following publications are available from Dave Strayer, Institute of Ecosystem Studies, P.O. Box AB, Millbrook, NY 12545; strayerd@ecostudies.org

- "Use of flow refuges by unionid mussels in rivers" (J. N. Amer. Benthol. Soc. 18: 468-476).
- "Changes in the distribution of freshwater mussels in the upper Susquehanna River basin, 1955-65 to 1996-97" (Amer. Midl. Nat. 142: 328-339).
- "Effects of alien species on freshwater mollusks in North America" (J. N. Amer. Benthol. Soc. 18: 74-98)
- "Transformations of freshwater ecosystems by bivalves: a case study of zebra mussels in the Hudson River" (BioScience 49: 19-27).
- "Dissolved oxygen declines in the Hudson River associated with the invasion of the zebra mussel" (Environ. Sci. Technol. 34: 1204-1210). "Statistical power of presence-absence data to detect population declines" (Conserv. Biol. 13: 1034-1038).

June 2000 Upper Tennessee River Zebra Mussel Survey Results

On May 31 and June 1 and 2, TVA divers surveyed adult zebra mussel populations in the Ft. Loudoun and Watts Bar Dam tailwaters, and just upstream from Sequoyah

between Chattanooga and Knoxville, in east Tennessee. Here are the results of this work:

Ft Loudoun Tailwater

Three sites were surveyed between Loudoun and Lenoir City (Tennessee River Miles 593.4 to 601.1). The density of adult zebra mussels was estimated by counting the number of zebra mussels a diver could pick up per minute of search time. This June, the estimate was 5.8 zebra mussels per minute. Similar surveys of these sites conducted in June 1999 produced an estimate of 3.4 zebra mussels per minute.

Watts Bar Tailwater

Adult zebra mussel densities were surveyed at two sites in the Watts Bar Dam tailwater, both near the intake to Watts Bar Nuclear Plant (Tennessee River Mile 528.0). The densities at these sites were estimated by counting all the live zebra mussels found within randomly placed 1/16-meter quadrat frames. During this survey, the average zebra mussel density within these quadrats was 2,795/m². In June 1999, the zebra mussel density in the same general area was 248/m².

Upstream of Sequoyah Nuclear Plant

Three sites on Chickamauga Reservoir upstream of Sequoyah Nuclear Plant (Tennessee River Miles 489.8 to 494.0) were surveyed using the same dive-time method used in the Ft. Loudoun Dam tailwater. This June, the adult zebra mussel count was 0.70 per minute of search time. Previous counts averaged 0.28 in June 1999.

Conclusions

These results indicate that adult zebra mussel densities have more than doubled in Ft. Loudoun tailwater and just upstream of Sequoyah Nuclear Plant since last year. In the Watts Bar tailwater. However, zebra mussel numbers have increased 11 fold over what they were in June 1999. If this increase in density survives through the summer, TVA's power plants and other industries on Chickamauga Reservoir could experience problems with their raw water systems this fall that might disrupt normal operations.

TVA divers will survey zebra mussel populations in the lower Clinch River and at sites on the lower Tennessee River during the mid-summer. Results of those surveys and fall surveys of some sites will be available from Bennie Kerley at the TVA Aquatic Biology Laboratory (865/632-1773).

Freshwater Mussels in the National Mollusc Collection of the Hebrew University in Jerusalem

3. the genus *Pseudunio**

Henk K. Mienis

National Mollusc Collection, Berman Building
Dept. Evolution, Systematics & Ecology
Hebrew University, IL-91904 Jerusalem, Israel
tel-fax: 00972.2.6584741 or 00972.8.9241459
E-mail: mienis@netzer.org.il & mienis@hotmail.com

The status of the genus *Pseudunio* Haas, 1910 (type species: *Unio sinuata* Lamarck, 1819 = *Unio auricularius* Spengler, 1793) has been a subject of dispute since its description. In recent years for instance it has been considered a junior synonym of *Margaritifera* Schumacher, 1816 by Daget (1998), a subgenus of *Margaritifera* by Van Damme (1984) and a full genus by Falkner (1994) and Gittenberger et al. (1998). The latter opinion has been adopted here.

Pseudunio contains only two living species: *Pseudunio auricularius* (Spengler, 1793) and *Pseudunio homsensis* (Lea, 1865).

The Giant Pearlshell: *Pseudunio auricularius*, occurred once in most of the larger rivers in Western Europe and in N.W. Africa. Since the beginning of the post-glacial period it shows a general recession in Europe (Preece et al., 1983), which has only been enhanced in the second half of the 20th Century by pollution and changes in the habitat. Today viable populations in Europe seem to be confined in their distribution to the basin of the Rio Ebro, Spain (Altaba, 1990, Araujo & Ramos, 1998a & 1998b). A smaller form of *Pseudunio auricularius* occurs still in N.W. Africa, where it is still commonly encountered in Morocco (Gittenberger et al., 1998). Due to its smaller size and isolated distribution it is here considered a subspecies: *Pseudunio auricularius maroccanus* (Pallary, 1918).

The second species, the Levant Pearlshell: *Pseudunio homsensis*, is restricted to a small area in the river Orontos, Syria, where it has been rediscovered only recently (Falkner, 1994).

From the conservational point of view *Pseudunio auricularius* is considered a critically endangered species by the IUCN. All measures should be employed to preserve the natural habitat of this giant freshwater pearl mussel. The exact status of *Pseudunio homsensis* is unclear. However, its restriction to an area suffering from an increasing number of water shortages that makes things more difficult for this threatened species

The National Mollusc Collection of the Hebrew University contains only three samples which are referable to the genus *Pseudunio*.

Pseudunio auricularius auricularius (Spengler, 1793)

ENGLAND: from Neolithic deposits in the old bed of the river Thames at Barn Elms, ex-Wintle/Blok (HU) 8030/two loose valves, of which one has been figured in Phillips, 1928: pl. 5, fig. 1); fossil layer in the river Thames near Mortlake, leg. A.S. Kennard, ex-Blok 11122 (HU) 8031/1).

Pseudunio auricularius maroccanus (Pallary, 1918)

MOROCCO: Oued Fès, leg. Martel, ex-Blok 8348 (HU) 36799/2 - paratypes of *Margaritana marocana* Pallary, 1918).

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* No. 2: Triannual Unionid Report, 19: 5-6. (2000)

Native Freshwater Mussels of the Upper Mississippi River System

Marian E. Havlik, Malacological Consultants, 1603 Mississippi Street, LaCrosse, WI 54601-4969, (608) 782-7958 and Jennifer S. Sauer, USGS-BRD, Upper Midwest Science Center, 2630 Fanta Reed Road, LaCrosse, WI 54603.

Native freshwater mussels are one of the most endangered groups of animals in North America. In the United States, 69 of 304 mussel species are listed as federally endangered or threatened. Surveys conducted over the past few decades have documented significant declines in mussel populations across the continent. Among the factors thought to be responsible for the decline are dams, pollution, siltation, commercial navigation, over harvest, and mortality caused by zebra mussel encrustation. Mussels are an important food source for muskrats, raccoons, minks, and bottom-feeding fishes. Commercially, shells of certain native mussel species are made into beads that are inserted into oysters as nuclei for cultured pearls.

Historically, 51 species have been documented in the Upper Mississippi River System (UMRS, which includes Mississippi and Illinois River mainstems), but only 44 species have been documented in surveys conducted within the past 35 years. This loss in species richness may be linked to habitat changes after the locks and dams were built. Nearly all of the species (7) not recently found in the UMRS were considered infrequent inhabitants of the UMRS mainstem by biologists in the late 19th and early 20th century, but were more commonly found in the tributaries of the UMRS.

The current conservation status of UMRS native mussels is summarized in Table 1. This table represents an update to Table 11-1 in the "Ecological Status and Trends of the Upper Mississippi River System 1998: A Report of the Long Term Resource Monitoring Program." In the table, we have included all 51 species of mussels historically found in the UMRS. The conservation status of native mussels varies from state to state. Each state describes the

state, not the UMRS as a whole. It is often difficult to interpret such a table because of the different definitions of the conservation status for each species and the variability in ranking procedures among the states.

Some species in Table 1 are not presently found in the UMRS mainstem. Species such as scaleshell and slippershell have usually been found in UMRS tributaries but only rarely in the UMRS itself. In 1913, upstream from Lock and Dam 19, mussel composition changed in part because some fishes that are obligatory hosts for mussels could not migrate past the dam. Other navigation dams built in the 1930's also affected mussels by changing the character of the river. The percent abundance of many mussel species has changed especially in pooled portions upstream of dams. For instance, the threeridge mussel is now the most abundant mussel species in the UMRS. The ebony shell (formerly composing 80% of the mussel fauna) and elephant-ear almost disappeared from the UMRS because populations of their primary host fish—the skipjack herring—declined sharply. Populations of other species such as the washboard, mapleleaf, flat floater, and Illluput mussels have increased in the pooled portions of the river.

Forty-four mussel species still exist in the UMRS proper and an additional 7 species survive in the immediate tributaries (within 100 miles of the UMRS). These include winged mapleleaf, snuffbox, ellipse shell, and cylindrical papershell. The UMRS and tributaries contain three species that are federally endangered (winged mapleleaf, Higgins eye, and fat pocketbook), and one species presently under federal review (scaleshell).

Please see accompanying table on page 16.

Malacological News from the Southeast Aquatic Research Institute

Paul D. Johnson, SARI, 5385 Red Clay Road, Cohutta, GA 30710 - e-mail pdj@sari.org.

A recent SARI inventory of the upper-Conasauga River watershed (a Coosa River tributary) has located 54 species of freshwater mollusks extant in the basin. The mussel fauna remains extremely diverse with 28 of the original 37 species still remaining in the basin. However, total numbers of live animals are at critically low levels. Surprisingly, 3 species of mussels were located live, that were considered extinct before this survey (*Pleurobema chattanoogaense*, *Pleurobema hanleyianum*, *Pleurobema troschelianum*). These species are currently undergoing phylogenetic analysis at the University of Alabama to determine their taxonomic status. Additionally, the institute has begun artificial propagation efforts aimed at restoring/securing the existing fauna. As part of this captive breeding program, 400 juvenile *Lampsilis altilis* were released earlier this month. Additional releases are expected this year till 2003. These releases are part of a much broader habitat

Table 1. Native mussel species (Order Unionoida) in the Upper Mississippi River System. Unless otherwise noted, species have been found alive in the Mississippi or Illinois Rivers since 1995 (Havlik pers. comm., Yaeger pers. comm.).

E = endangered, T = threatened, SC = special concern, X = extirpated, CS = candidate species
 TR = not presently in the Mississippi River, but alive in major tributaries of the UMRS
 ^Wisconsin and Iowa treat these two as separate species
 #Possibly extirpated from UMRS ¹Year of publication for state and federal listings

Common name	Species	Year of Last Observation	Year of publication for state and federal listings					
			Federal 1999 ¹	Illinois 1999 ¹	Iowa 1995 ¹	Minnesota 1996 ¹	Missouri 1999 ¹	Wisconsin 1997 ¹
Subfamily Cumberlindinae								
Spectaclecase	<i>Cumberlandia monodonta</i> (Say, 1829)			E	E	T	SC	E
Subfamily Ambleminae								
Threeridge	<i>Amblema plicata</i> (Say, 1817)							
Purple wartyback	<i>Cyclonaias tuberculata</i> (Rafinesque, 1820)	1991		T	T	T		E
Elephantear	<i>Elliptio crassidens</i> (Lamarck, 1819)	1977		T		E	E	E
Spike	<i>Elliptio dilatata</i> (Rafinesque, 1820)			T		SC		
Ebonyshell	<i>Fusconaia ebena</i> (L. Lea, 1831)			T		E	E	E
Wabash pigtoe	<i>Fusconaia flava</i> (Rafinesque, 1820)					T		SC
Washboard	<i>Megalonaias nervosa</i> (Rafinesque, 1820)			E	E	E	E	E
Sheepnose	<i>Plethobasus cyphus</i> (Rafinesque, 1820)				E	T		SC
Round pigtoe	<i>Pleurobema sintoxia</i> (Rafinesque, 1820)					T		SC
Winged mapleleaf (TR)	<i>Quadrula fragosa</i> (Conrad, 1835)	1921	E			E	E	E
Monkeyface	<i>Quadrula metanevra</i> (Rafinesque, 1820)					T		T
Wartyback	<i>Quadrula nodulata</i> (Rafinesque, 1820)					E	SC	T
Pimpleback	<i>Quadrula p. pustulosa</i> (L. Lea, 1831)							
Mapleleaf	<i>Quadrula quadrula</i> (Rafinesque, 1820)							
Pistolgrip	<i>Tritogonia verrucosa</i> (Rafinesque, 1820)				E	T		T
Pondhorn (TR)	<i>Unio merus tetralasmus</i> (Say, 1831)	1919						
Subfamily Anodontinae								
Elktoe	<i>Alasmidonta marginata</i> (Say, 1818)					T	SC	SC
Slippershell mussel (TR)	<i>Alasmidonta viridis</i> (Rafinesque, 1820)	1883		T	E			T
Flat floater	<i>Anodonta suborbiculata</i> (Say, 1831)						SC	SC
Cylindrical papershell (TR)	<i>Anodontoidea ferussacianus</i> (L. Lea, 1834)	1883			T		SC	
Rock pocketbook	<i>Arcidens confragosus</i> (Say, 1829)					E	SC	T
White heelsplitter	<i>Lasmigona c. complanata</i> (Barnes, 1823)							
Creek heelsplitter	<i>Lasmigona compressa</i> (L. Lea, 1829)	1979			T	SC		
Flutedshell	<i>Lasmigona costata</i> (Rafinesque, 1820)					SC		
Giant floater	<i>Pyganodon grandis</i> (Say, 1829)							
Salamander mussel	<i>Simpsonia ambigua</i> (Say, 1825)	1982		E		T	SC	T
Creeper	<i>Strophitus undulatus</i> (Say, 1817)				T			
Paper pondshell	<i>Utterbackia imbecillis</i> (Say, 1829)							
Subfamily Lampsilinae								
Mucket	<i>Actinonaias ligamentina</i> (Lamarck, 1819)					T		
Butterfly	<i>Ellipsaria lineolata</i> (Rafinesque, 1820)			T	T	T		E
Snuffbox (TR)	<i>Epioblasma triquetra</i> (Rafinesque, 1820)	1920		E		T	SC	E
Plain pocketbook	<i>Lampsilis cardium</i> (Rafinesque, 1820)							
Higgins eye	<i>Lampsilis higginsii</i> (L. Lea, 1857)		E	E	E	E	E	E
Fatmucket	<i>Lampsilis siliquoidea</i> (Barnes, 1823)							
^Yellow sandshell	<i>Lampsilis teres anodontoides</i> (L. Lea, 1831)				E	E		E
^Slough sandshell	<i>Lampsilis teres teres</i> (Rafinesque, 1820)				E			E
Fragile papershell	<i>Leptodea fragilis</i> (Rafinesque, 1820)							
#Scaleshell (TR)	<i>Leptodea leptodon</i> (Rafinesque, 1820)	1921	CS				SC	X
Black sandshell	<i>Ligumia recta</i> (Lamarck, 1819)			T		SC	SC	
Pondmussel	<i>Ligumia subrostrata</i> (Say, 1831)	1968						
Threehorn wartyback	<i>Obliquaria reflexa</i> (Rafinesque, 1820)					SC	SC	
Hickorynut	<i>Obovaria olivaria</i> (Rafinesque, 1820)							
Pink heelsplitter	<i>Potamilus alatus</i> (Say, 1817)							
#Fat pocketbook	<i>Potamilus capax</i> (Green, 1832)	1986	E	E			E	X
Pink papershell	<i>Potamilus ohioensis</i> (Rafinesque, 1820)							
Bleufer	<i>Potamilus purpuratus</i> (Lamarck, 1819)	1975						
Illinoist	<i>Toxolasma parvius</i> (Barnes, 1823)							

FMCS 1999 Freshwater Mollusk Bibliography

Compiled by Kevin Cummings.

The following bibliography lists papers dealing with freshwater mollusks that have been published in 1999. The citations will be split into five groups: Unionoida, Sphaeriidae, Corbicula, Dreissenoldea, and Gastropoda. Those papers which list taxa from more than one of the above categories will be included in each group. To insure that papers are cited correctly, researchers are encouraged to send reprints, omissions or corrections to: Kevin S. Cummings, Illinois Natural History Survey, 607 E. Peabody Drive, Champaign, Illinois 61820. email: ksc@inhs.uiuc.edu.

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Freshwater Mollusk Conservation Society - 2000 Membership Roster

Please notify the society secretary, Rita Villella (address below) of any corrections, additions or deletions

A

Steve Ahlstedt
USGS-WRD
1820 Midpark Drive
Suite-A
Knoxville, TN 37828
ahlstedt@usgs.gov
423-545-4140 ext. 17
Fax: 423-545-4496

John Alderman
244 Red Gate Road
Pittsboro, NC 27312
aldermjm@interpath.com
919-542-5331

Richard V. Anderson
Dept. Of Biological Sciences
Western Illinois University
Waggoner Hall 381
Macomb, IL 61455
richard_anderson@ccmail.wiu.edu
309-298-1553
Fax: 309-298-2270

Robert Anderson
USGS
1000 Church Hill Road
Pittsburgh, PA 15211
rmanders@usgs.gov
412-490-3810
Fax: 412-490-3828

Tamara Anderson
1627 S. Summit
Newcastle, WY 82701
tander@trib.com
307-746-2046

Herbert D. Athearn
5819 Benton Pike NE
Cleveland, TN 37323-5301
423-476-4963

B

Peter Badra
Michigan Natural Features Inventory
Mason Building
P.O. Box 30444
Lansing, MI 48909-7944
pjbadra@hotmail.com
517-241-4179
Fax: 517-373-6705

Terry Balding
Biology Department
Univ. Wisconsin Eau Claire
Eau Claire, WI 54702
baldinta@uwec.edu
423-836-5089

Chris Barnhart
Biology Department
Southwest Missouri State Univ.
701 S. National Ave.
Springfield, MO 65804
chrisbarnhart@mail.smsu.edu
417-836-5166
Fax: 417-836-4204

David J. Berg
Dept. of Zoology
Miami University
Pearson Hall, Room 212
Hamilton, OH 45011
bergdj@muohio.edu
513-529-3174
Fax: 513-529-6900

Richard Biggins
USFWS
160 Zillicoa Street
Asheville, NC 28801
BigginsRG@cs.com
828-258-3939 ext.228
Fax: 828-258-5330

Holly Blalock-Herod
USGS-BRD
Florida Caribbean Science Center
7920 NW 71st St.
Gainesville, FL 32653
holly_blalock@usgs.gov
352-378-8181 ext. 354
Fax: 352-378-4956

Arthur E. Bogan
NC State Museum Natural Sciences
Research Laboratory
4301 Reedy Creek Road
Raleigh, NC 27607
arthur.bogan@ncmail.net
919-733-7450 ext.753
Fax: 919-715-2294

Susan R. Bolden (student)
Louisiana St. Univ.
P.O. Box 20051
Baton Rouge, LA 70894
sbolden@unix1.sncc.lsu.edu
225-388-1740

Jeannette Bowers-Altman
NJ Endangered & Nongame Species
NJ Div. Fish & Wildlife
220 Blue Anchor Road
Sicklerville, NJ 08081

Angela Boyer
USFWS
6950 Americana Pkwy, Suite H
Reynoldsburg, OH 43068
angela_boyer@fws.gov
614-469-6923 ext. 22
Fax: 614-469-6919

Tony Brady (student)
TN Coop. Fishery Research Unit
TN Tech
205 Pennebaker Hall
N. Dixie Ave.
Cookeville, TN 38501
tonybrady@tntech.edu
931-372-3094

Jayne Brim-Box
USGS/BRD
787 N 1500 E
Logan, UT 84321
jayne_brim_box@usgs.gov
435-792-4105

David K. Britton
Dept. of Biology
University of Texas at Arlington
Box 19498
Arlington, TX 76019
817-272-5577
Fax: 817-272-2855
dkbritton@home.com

Joshua Britton
RRI
PO Box 3634
Lacrosse, WI 54602
601-781-8770
Fax: 601-781-8771
rrisubsea@aol.com

B

Aaron Brown
P.O. Box 739
Kotzebue, AK 99752
907-442-3195
Fax: 907-442-3195
aaron_brown@mac.com

Dr. Kenneth M. Brown
Dept. Biological Sciences
Louisiana State Univ.
508 LSB
Baton Rouge, LA 70803-1725
zobrow@lsuvm.sncc.lsu.edu
225-388-4201
Fax: 225-388-8826

Sue Bruenderman
MO Dept. of Conservation
1110 S. College Ave.
Columbia, MO 65201
bruens@mail.conservation.state.mo.us
573-882-9880
Fax: 573-882-4517

Alan Buchanan
MO Dept. Conservation
1110 S. College Ave.
Columbia, MO 65201
buchaa@mail.conservation.state.mo.us
573-882-9880
Fax: 573-882-4517

Janet Butler
USFWS
1444 Washington Ave.
Parkersburg, WV 26101
304-422-0752
Fax: 304-422-0754
janet_butler@fws.gov

Robert S. Butler
USFWS
160 Zillicoa Street
Asheville, NC 28801
bob_butler@fws.gov
828-258-3939 ext. 235
Fax: 828-258-5330

C

Christopher Catotti
PO Box 621777
Oviedo, FL 32762-1777
407-384-3913
Fax: 407-384-3888
kd4ace@compuserve.com

Ronald Cicerello
KY State Nature Preserves Comm.
801 Schenkel Lane
Frankfort, KY 40601
ronald.cicerello@mail.state.ky.us
502-573-2886
Fax: 502-573-2355

Janet Clayton
WV Division Natural Resources
P.O. Box 67
Elkins, WV 26241
jclayton@dnr.state.wv.us
304-637-0245
Fax: 304-637-0250

Leslie Colley
The Nature Conservancy
389 Public Square
Columbia, TN 38401
lcolley@tnc.org
931-840-8881

Ed Collins
McHenry Co Conservation Dist.
6512 Harts Road
Ringwood, IL 60072
lmgotbrut@rsg.org
815-678-4431
Fax: 815-653-1960

W. Gregory Cope
Dept. of Toxicology
North Carolina State University
Box 7633
Raleigh, NC 27695-7633
greg_cope@ncsu.edu
919-515-5296
Fax: 919-515-7169

James R. Cordeiro
American Museum of Natural History
Central Park West at 77th Street
New York, NY 10024
212-769-5720
Fax: 212-769-5783
cordeiro@amnh.org

Catherine Corey (student)
SUNY-Albany
190 Cameo Drive
Danville, CA 94526
tr-cc@worldnet.att.net
925-837-2556

Kevin Cummings
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, IL 61820
ksc@inhs.uiuc.edu
217-333-1623
Fax: 217-333-4949

D

Chris Davidson
AR Dept. of Environmental Quality
Box 8913
8001 National Drive
Little Rock, AR 72219-8913
davidson@adeq.state.ar.us
501-682-0667
Fax: 501-682-0910

Derek Davis
Nova Scotia Museum of Natural
History
10 Forest Road
Dartmouth, Nova Scotia
B3A 2M3
ap775@chebucto.ns
902-469-9469

Mike Davis
MN DNR
1801 South Oak St.
Lake City, MN 55041
mike.davis@dnr.state.mn.us
651-345-3331
Fax: 651-345-3975

Sheila Davis
USFWS - WV Field Office
694 Beverly Pike
Elkins, WV 26241
304-636-6586
Fax: 304-636-7824
sheila_davis@fws.gov

Dr. Robert T. Dillon, Jr.
Department of Biology
College of Charleston
66 George Street
Charleston, SC 29424
dillonr@cofc.edu
843-953-8087
Fax: 843-953-5453

D

Ron Dimock
Wake Forest University
P.O. Box 7325
Dept. of Biology
Winston-Salem, NC 27109
dimock@wfu.edu
336-758-5567
Fax: 336-758-6008

Gerald Dinkins
Dinkins Biological Consulting
7103 Bayless Ln
Powell, TN 37849
865-938-7739
Fax: 865-938-5081
bidink@aol.com

Tony DiPaolo (student member)
Virginia Tech
101 Cheatham Hall
Blacksburg, VA 24061-0321
ldipaolo
540-231-3329
Fax: 540-231-7580

Steve Duke
USFWS
1387 South Vinnell Way
Room 368
Boise, ID 83709
steve_duke@fws.gov
208-378-5345
Fax: 208-378-5262

Kari Duncan
USFWS
8514 Electric Ave.
Vienna, VA 22182
kari_duncan@fws.gov
703-358-2464
Fax: 703-358-2044

Heidi L. Dunn
Ecological Specialists, Inc.
114 Algana Court
St. Peters, MO 63376
Ecologists@aol.com
636-447-5355
Fax: 636-447-4101

Stanley Dvorny
Field Museum Volunteer
3512 Woodside
Brookfield, IL 60513
708-387-0687

E

David Edds
Dept. of Biology
Campus Box 4050
Emporia State University
Emporia, KS 66801-5087
david_edds@emporia.edu
316-341-5622
Fax: 316-341-5607

Amy Lynn Edwards
GA Museum of Natural History
Univ. of Georgia
Athens, GA 30602-1882

Robin Engelking
3650 Brookdale Dr. N.
Brooklyn Park, MN 55443-2351
raqbe@usinternet.com

F

Mark Fagg
TN Wildlife Resource Agency
6032 W. AJ Highway
Talbott, TN 37877
mfagg@mail.state.tn.us
423-587-7037
Fax: 423-587-7057

Lori D. Fasone
9696 Hayne Boulevard # C24
New Orleans LA 70127

Brant Fisher
Indiana DNR
Atterbury Fish & Wildlife Area
7970 South Rowe Street
Edinburgh, IN 46124
fisherbe@netdirect.net
812-526-5816
Fax: 812-526-2892

Steve Fraley
TVA
917 W. Brushy Valley Rd.
Powell, TN 37849
sjfraley@tva.gov
865-938-1605

Terrence Frest
2517 NE 65th Street
Seattle, WA 98115-7125
206-627-6764
Fax: 206-527-6764
tjrest@accessone.com

G

Jeff Garner
AL Div. Wildlife & Freshwater Fisheries
P.O. Box 366
Decatur, AL 35602
bleufer@aol.com
256-766-2565
Fax: 256-340-0402

Jim Godwin
AL Natural Heritage Program
The Nature Conservancy
Huntingdon College
1500 E. Fairview Ave.
Montgomery, AL 36106-2148
jgodwin@zebra.net
334-834-4519 ext. 25
Fax: 334-834-5439

Larry Goldman
P.O. Drawer 1190
Daphne, AL 36526
334-441-5181
Fax: 334-441-6222

Daniel Graf (student)
University of Michigan
Museum of Zoology
1109 Geddes Ave.
Ann Arbor, MI 48109
dgraf@umich.edu
734-764-0470

Dr. Lane Colin Graham
Dept. of Zoology
The University of Manitoba
Winnipeg, MB R3T 2N2
Canada

H

Wendell R. Haag
USDA Forest Service
Forest Hydrology Lab
1000 Front Street
Oxford, MS 38655
whaag@fs.fed.us
662-234-2744
Fax: 662-234-8318

Randall C. Haddock
Cahaba River Society
2717 7th Ave. South, Suite 205
Birmingham, AL 35233-3421
cahaba@igc.org
205-322-5326
Fax: 205-324-8346

H

James T. Hall
Duke Energy Corp.
Environmental Center MG03A3
13339 Hagers Ferry Road
Huntersville, NC 28078
704-875-5423
Fax: 704-875-5032
jjhall@duke-energy.com

Willard N. Harman
SUNY - Oneida
Biological Field Station
5838 State Hwy 80
Cooperstown, NY 13326
607-547-8778
Fax: 607-547-5114
hamanwn@oneida.edu

Dr. Julian R. Harrison
The College of Charleston
The Charleston Museum
738 Swanson Ave.
Charleston, SC 29412-9140
harrisonj@cofc.edu
843-953-1808
Fax: 843-953-5453

Paul Hartfield
USFWS
6578 Dogwood View Highway
Jackson, MS 39213
601-321-1125
Fax: 601-965-4340
paul_hartfield@fws.gov

Marian Havlik
Malacological Consultants
1603 Mississippi Street
LaCrosse, WI 54601-4969
608-782-7958
Fax: 608-782-7958
havlikme@aol.com

Tom Hayes
Pittsburgh Zoological
Aquatic Division
938 N. Sheridan Ave.
Pittsburgh, PA 15206
MQHayes@aol.com
412-361-6194

David Heath
WI DNR
107 Sutliff Ave.
Rhineland, WI 54501
heathd@dnr.state.wi.us

715-365-8979
Fax: 715-365-8932

Don Helms
Helms & Associates
814 North 7th Street
Bellevue, IA 52031-9321
helmsdon@cis.net
319-872-4563
Fax: 319-872-3054

Max Henschen
3023 Winfield Ave.
Indianapolis, IN 46222-1951
mhensche@dem.state.in.us
317-232-8623
Fax: 317-232-8406

Jeffrey Herod
3515 284th Street
Branford, FL 32008
jeff_herod@usgs.gov
352-378-8181 ext. 353
Fax: 352-378-4956

Michael A. Hoggarth
Otterbein College
Dept. Of Life and Earth Sciences
Westerville, OH 43081
mhoggarth@otterbein.edu
614-823-1667
Fax: 614-823-3042

Ellet Hoke
1878 Ridgeview Circle Drive
Manchester, MO 63021
feh@postnet.com
314-391-9459

Daniel J. Hornbach
Macalester College
1600 Grand Ave.
St. Paul, MN 55113
hornbach@macalester.edu
651-696-6160
Fax: 651-696-6045

Mark Hove
Department of Fisheries
University of Minnesota
1980 Folwell Ave.
St. Paul, MN 55108
Mark.Hove@fw.umn.edu
612-624-3019
Fax: 612-625-5299

Chuck Howard
Ecological Specialists, Inc.
114 Algana court
St. Peters, MO 63376
ecologist3@aol.com
636-447-5355
Fax: 636-447-4101

Robert G. Howells
Texas Parks & Wildlife
160 Bear Skin Trail
Kerrville, TX 78028
rhowells@ktc.com
830-866-3356
Fax: 830-866-3549

Don Hubbs
TN Wildlife Res. Agency
P.O. Box 70 C
Camden, TN 38320
TNMussels@aol.com
901-584-9032
Fax: 901-584-9032

Robert G. Hudson
Biology Dept.
Presbyterian College
503 S. Broad Street
Clinton, SC 29325
rhudson@presby.edu
864-833-8448
Fax: 864-833-8993

Mark H. Hughes
Champion Int. Corporation
P.O. Box 250
560 Tennessee Street
Courtland, AL 35618
hughma@champint.com
256-637-7271
Fax: 256-637-7207

J

Joan Jass
Milwaukee Public Museum
800 W. Wells
Milwaukee, WI 53233
jass@mpm.edu
414-278-2761
Fax: 414-278-6100

John Jenkinson
305 Revere Ave.
Clinton, TN 37716
jjjenk@mindspring.com
865-457-0174

J

Sue Jennings
National Park Service
Big South Fork NRR
4564 Leatherwood Rd.
Oneida, TN 37841
sue_jennings@nps.gov
423-569-2404 ext. 252

Judith A. Johnson
North Carolina WRC
349-D Bynum Ridge Rd.
Pittsboro, NC 27312
jjohnson@ncdial.net
919-542-6031

Paul Johnson
SARI - Field Headquarters
5385 Red Clay Road
Cohutta, GA 30710
pdj@sari.org
706-694-4419
Fax: 706-694-3957

Richard I. Johnson
Dept. of Mollusks
Museum of Comparative Zoology
Harvard University
Cambridge, MA 02137

Robert L. Jones
Mississippi Dept. of Wildlife, Fisheries,
and Parks
2148 Riverside Drive
Jackson, MS 39202
601-354-7303
Fax: 601-354-7227
bob.jones@mmns.state.ms.us

K

Byron Karns (student)
813 River Street
P.O. Box 401
Taylors Falls, MN 55084-0401

Brian Keas
Michigan State University
Dept. of Zoology
East Lansing, MI 48824
517-355-6474
Fax: 517-432-2789
keasbria@msu.edu

Eugene Keferl
Dept. Natural Sciences & Mathematics
Coastal Georgia Community College
3700 Altama Ave.
Brunswick, GA 31520
keferl@bc9000.bc.peachnet.edu
912-262-3089

James Kellogg
VT Dept Environmental Conservation
Water Quality Division
103 South Main Street
Waterbury, VT 05671
jimk@dec.anr.state.vt.us
802-244-4520
Fax: 802-241-3008

Daniel Kelner
MN DNR
500 Lafayette Rd.
P.O. Box 225
St. Paul, MN 55155-4025
dan.kelner@dnr.state.mn.us
651-282-2509
Fax: 651-296-1811

Kim Kendall
VT Natural Resources Council
9 Bailey Ave.
Montpelier, VT 05602
802-223-2328
Fax: 802-223-0287
kkendall@together.net

John Kent
394 Cub Creek Road
Chapel Hill, NC 27514-6327
jkent@tmug.org
919-933-5650

David Kesler
Rhodes College
2000 N. Parkway
Memphis, TN 38112
kesler@rhodes.edu
901-843-3557
Fax: 901-843-3565

Helen Elise Kitchel
Wisconsin DNR/BER
101 S. Webster St.
Madison, WI 53715
kitchel@mail01.dnr.state.wi.us
608-266-5248
Fax: 608-266-2925

Bill Kittrell
The Nature Conservancy
146 E. Main Street
Abingdon, VA 24210
bkittrell@naxs.net
540-676-2209
Fax: 540-676-3819

Roger Klocek
2756 Rolling Meadows Drive
Naperville, IL 60564
aqconserve@aol.com
312-692-3233

Leroy Koch
US Fish & Wildlife Service
265 Bogey Drive
Abingdon, VA 24211
leroy_koch@fws.gov
540-623-1233
Fax: 540-623-1233

Martin Kohl
3003 Greenway Drive
Knoxville, TN 37918

L. Russert Kraemer
University of Arkansas
Dept. Biological Sciences
Fayetteville, AR 72701
rkraemer@comp.uard.edu
501-575-3251
Fax: 501-575-4010

Jennifer Kurth
1808 Stevens Ave. S. #9
Minneapolis, MN 55403
kurth005@tc.umn.edu
612-870-4429

L

J. Jerry Landye
USFWS
P.O. Box 851
Mescalero, NM 88340
505-671-9116
Fax: 505-671-4562

James B. Layzer
TN Coop. Fishery Research Unit
Tennessee Tech University
Box 5114
Cookeville, TN 38505
jim_layzer@tntech.edu
931-327-3032

L

Jacque Lee (student)
Univ. of Northern British Columbia
1175 Chapman Street
Victoria BC
Canada V8V 2T5
jacque_lee@telus.net
250-382-3824

William Lellis
USGS
RD 4, Box 63
Wellsboro, PA 16901
lelliswm@epix.net
570-724-3322 ext. 240
Fax: 570-724-2525

Jay Levine
College of Veterinary Medicine
4700 Hillsborough Street
Raleigh, NC 27606
jay_levine@ncsu.edu
919-513-6397
Fax: 919-573-6464

Dr. Charles Lydeard
Dept. of Biological Sciences
Univ. of Alabama
Box 870345
Tuscaloosa, AL 35487
clydeard@biology.as.ua.edu
205-348-1792
Fax: 205-348-1786

Madeleine Lyttle
USFWS
1232 Hunt Road
New Haven, VT 05472
madeleine_lyttle@fws.gov
802-453-7503
Fax: 802-453-7503

M

Susan Mangin
USFWS
4401 N. Fairfax Drive
Suite 840
Arlington, VA 22203
susan_mangin@fws.gov
703-358-1718
Fax: 703-358-2044

Paul Marangelo
Ecological Specialists, Inc.
114 Algana Court

ecologist4@aol.com
636-447-5355
Fax: 636-447-4101

Ellen Marsden
Alhen Center
University of Vermont
Burlington, VT 05405
emarsden@nature.snr.uvm.edu
802-656-0684
Fax: 802-656-8683

Scott Martin
Museum of Biodiversity
Ohio State Univ.
712 Harley Drive
Columbus, OH 43202
smartin@cas.org
614-447-3600 ext. 2483

A. David Martinez
6315 E. 57th Place
Tulsa, OK 74135-8122
david_martinez@fws.gov
918-581-7458 x 228
Fax: 918-581-7467

Lawrence L. Master
The Nature Conservancy
201 Devonshire St., 5th Floor
Boston, MA 02110
lmaster@tnc.org
617-542-1908
Fax: 617-482-5866

Charles M. Mather
Univ. of Science and Arts of Oklahoma
Box 82345
Chickasha, OK 73018
facmathercm@usao.edu
405-224-7959

Christine Mayer
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, IL 61820
c-mayer2@uiuc.edu
217-244-2354

Mary T. McCann
Duke Engineering & Services
500 Washington Ave.
Portland, ME 04103
mtmccann@dukeengineering.com
207-775-4495
Fax: 207-775-1031

Leigh Ann McDougal
US Forest Service
Ecosystem Conservation Unit
1323 Club Drive
Vallejo, CA 94592
lmcdougal@fs.fed.us
707-562-8935
Fax: 707-562-9050

Monte A. McGregor
VA Dept. Game & Inland Fisheries
1132 Thomas Jefferson Road
Forest, VA 24551
mmcgregor@dgif.state.va.us
(804) 525-7522
Fax: (804) 525-7720

Stuart McGregor
Geological Survey of Alabama
P.O. Box 869999
420 Hackberry Lane
Tuscaloosa, AL 35486-6999
smcgregor@gsa.state.al.us
205-349-2852
Fax: 205-349-2861

Robert McMahon
Dept. of Biology
Box 19498
Univ. of Texas at Arlington
Arlington, TX 76019
r.mcmahon@uta.edu
817-272-2412
Fax: 817-272-2855

Stephen E. McMurray
Kentucky Division of Water
Water Quality Branch
14 Reilly Road
Frankfort, KY 40601
Steve.McMurray@mail.state.ky.us
502-564-3410
Fax: 502-564-0111

Henk K. Mienis
National Mollusc Collection
Dept. of Evolution, Systematics, and
Ecology
Hebrew University of Jerusalem
Jerusalem, 70395
ISRAEL
00972-2-6585877
mienis@metzer.org.il

M

Deb Mignogno
USFWS
4125 Woodview Drive
Cookeville, TN 38501
deb_mignogno@fws.gov
931-528-6481 ext. 209
Fax: 931-528-7075

Cristi Milam
Arkansas State University
P.O. Box 599
State University, AR 72467
870-972-2570
Fax: 870-972-2577

Glenn Miller
GLIFWC
P.O. Box 9
Odonah, WI 54861
715-682-6619
Fax: 715-682-9294
gmiller@glifwc.org

Tonya Moore
NC Wildlife Resources Commission
Nongame & Endangered
1634 Lombardy Circle
Charlotte, NC 28203
mooret@interpath.com
704-377-5387

Patricia Morrison
USFWS
Ohio River Islands NWR
P.O. Box 1811
Parkersburg, WV 26102
patricia_morrison@mail.fws.gov
304-422-0752
Fax: 304-422-0754

Mr. William A. Montgomery
3613 Norwich Ave.
Cincinnati, OH 45220
513-559-1692

Andrea Mummert (student)
408 E. Roanoke Street
Blacksburg, VA 24060
amummert@vt.edu
540-953-3293

Mussel Mitigation Trust (contributing)
c/o Bob Schnelle, Chair
139 East Fourth Street
Cincinnati, OH 45202

bschnelle@cinergy.com
513-287-2239
Fax: 513-287-3499

Melody Myers-Kinzie
Dept. Forestry & Natural Resources
Forest Products Bldg.
Purdue University
West Lafayette, IN 47905
melodym-k@fnr.purdue.edu
765-494-3620
Fax: 765-496-1344

N

Richard Neves
Dept. of Fish & Wildlife
Virginia Tech
Blacksburg, VA 24061
mussel@vt.edu
540-231-5927
Fax: 540-231-7580

April Newman (Student member)
221 N. Cherry Ave.
Tucson, AZ 85719
shellfan99@aol.com
520-629-9371

Teresa Newton
USGS
Upper Midwest Environ. Sciences
Center
2630 Fanta Reed Road
La Crosse, WI 54603
teresa_newton@usgs.gov
608-781-6217
Fax: 608-781-6066

Susan Jerrine Nichols
USGS
Great Lakes Science Center
1451 Green Road
Ann Arbor, MI 48105
s_jerrine_nichols@usgs.gov
734-214-7218
Fax: 734-994-8780

O

Brian Obermeyer
Route 2 Box 141
Eureka, KS 67045
bko@eurekaerald.com
316-583-6096

Scott O'Dee
Ohio State University
1687 Gypsy Lane
Columbus, OH 43229
odee.2@osu.edu
614-292-1613
Fax: 614-292-0181

Ronald Oesch
872 Fuhrmann Ter.
Saint Louis, MO 63122-3222
ron_oesch@yahoo.com
314-822-4935

P

Paul W. Parmalee
Frank H. McClung Museum
University of Tennessee
Knoxville, TN 37996
865-974-2144
Fax: 865-974-3827

Malcolm Pierson
Alabama Power Company
204 Stetson Lane
Alabaster, AL 35007
jmpierse@southernco.com
205-664-6177
Fax: 205-664-6309

Michael J. Pinder
VDGIF
2206 S. Main Street, Suite C
Blacksburg, VA 24060
mpinder@dgif.va.us
540-552-6992
Fax: 540-951-8011

Kate Pipkin
NC Wildlife Resources
13339 Hagers Ferry Road
MGO3A3
Huntersville, NC 28078
704-875-5412
Fax: 704-875-5032
pipkinks@interpath.com

Cindy Podraza (student)
Northeastern Illinois University
346 Woodbridge
Des Plaines, IL 60016
cpod99@aol.com
847-296-9370

P

Bill Posey
Arkansas Game & Fish Commission
915 E. Sevier St.
Benton, AR 72015
brposey@agfc.state.ar.us
501-776-0218
Fax: 501-776-8662

Thomas Proch
PA Dept. Environmental Protection
2721 Cedric Ave.
Pittsburgh, PA 15226
tproch@stargate.net
412-442-4052
Fax: 412-442-4328

R

Brenda Rashleigh
U.S. EPA
960 College Station Road
Athens, GA 30605
rashleigh.brenda@epa.gov
706-355-8148
Fax: 706-355-8104

William C. Reeves
TN Wildlife Resources Agency
Fisheries Management Division
PO Box # 40747
Nashville, TN 37204
615-781-6575
Fax: 615-781-6667
breeves@mail.state.tn.us

Elpidio A. Remigio
Univ. of Guelph
Dept. of Zoology
Axelrod Building
Guelph, Ontario
Canada N1G 2W1
eremigio@uoguelph.ca
519-824-4120
Fax: 519-767-1656

Kevin Roe
425 Collections Building
University of Alabama
Tuscaloosa, AL 35487
kroe@biology.as.ua.edu
205-348-1805
Fax: 205-348-6460

Susan Rogers
1616 Rushing Circle
Conway, AR 72032

501-328-0351
susan_rogers@fws.gov

Eric Romaniszyn
EnviroScience, Inc.
3781 Darrow Road
Stow, OH 44224
eromaniszyn@envirosienceinc.com
330-688-0111
Fax: 330-688-3858

Nick Rowse
USFWS
Twin Cities Field Office
4101 E. 80th Street
Bloomington, MN 55425-1665
612-725-3548 x 210
Fax: 612-725-3609
nick_rowse@fws.gov

Robert D. Roy
Woodlot Alternatives, Inc.
122 Main St. No. 3
Topsham, ME 04086
broy@woodlotalt.com
207-729-1199
Fax: 207-729-2715

Louie Rundo
Cleveland State University
647 Rehwinkel Road
Sagamore Hills, OH 44067
330-467-7288
l.rundo@popmail.csuohio.edu

S

Robert W. Schanzle
Illinois DNR
524 South Second Street
Springfield, IL 62701-1787
bschanzle@dnrmail.state.il.us
217-785-4863
Fax: 217-557-0728

Beth Schilling
11931 Couch Mill Road
Knoxville, TN 37932
865-691-8267
e7s@ornl.gov
schillingbeth@hotmail.com

Frieda Schilling
3707 Lan Drive
St. Louis, MO 63125-4415
314-892-3454

Kathryn Schneider
NY Natural Heritage Program
700 Troy-Schenectady Road
Latham, NY 12110-2400
kjschnei@gw.dec.state.ny.us
518-783-3937
Fax: 518-783-3916

Guenter Schuster
Eastern Kentucky university
Dept. of Biological Sciences
Richmond, KY 40475
606-622-1016
Fax: 606-622-1399
bioschus@eku.edu

John Schwegman
3626 Riverpoint Lane
Metropolis, IL 62960
botany@midwest.net
618-543-9429

Stephanie Sherraden (student)
Kansas State University
830 Fremont Apt. 1
Manhattan, KS 66502

Emmett B. Shotts, Jr.
USGS-BRD
National Fish Health Research
Laboratory
1700 Leetown Road
Kearneysville, WV 25430
emmett_shotts@usgs.gov
304-724-4430
Fax: 304-724-4435

Peggy Shute
TVA Regional Natural Heritage Project
P.O. Box 1589
Norris, TN 37828-1589
865-632-1661
Fax: 865-632-1795
pwshute@tva.gov

James B. Sickel
Murray State University
1708 Olive Street
Murray, KY 42071
jim.sickel@murraystate.edu
270-762-6326

S

Bernard Sietman
Illinois Natural History Survey
Center for Biodiversity
607 E. Peabody Dr.
Champaign, IL 61820
bsietman@inhs.uiuc.edu
217-244-4694
Fax: 217-333-4949

Christopher Skelton
Georgia DNR
Natural Heritage Program
2117 U.S. Hwy 278, SE
Social Circle, GA 30677
chris_skelton@mail.dnr/state.ga.us
770-918-6411
Fax: 706-552-3032

Allan K. Smith
3542 SW Falcon Street
Portland, OR 97219
503-246-6426

David R. Smith
USGS-BRD
Leetown Science Center
1700 Leetown Road
Kearneysville, WV 25430
david_r_smith@usgs.gov
304-724-4467
Fax: 304-724-4465

Douglas Smith
Campus Distribution Phys. Plant
University of Massachusetts
Biology Morrill Science South
Amherst, MA 01003
dgsmith@bio.umass.edu
413-545-1956
Fax: 413-545-3243

Janice L. Smith
Environment Canada
National Water Research Institute
P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario L7R 4A6
Janice.Smith@cciw.ca
905-336-4685
Fax: 905-336-4420

David H. Stansbery
Museum of Biological Diversity
Ohio State University
1315 Kinnear Road
Columbus, OH 43212-1192

stansbery.1@osu.edu
614-292-8560
Fax: 614-292-7774

Clifford E. Starliper
USGS/BRD
Fish Health Laboratory
Leetown Science Center
1700 Leetown Road
Kearneysville, WV 25430
cliff_starliper@usgs.gov
304-724-4433
Fax: 304-724-4435

James F. Steffen
Chicago Botanic Garden
1000 Lake Cook Road
Glencoe, IL 60022
jsteffen@chicagobotanic.org

Janet Sternburg
MO Dept. of Conservation
Natural History Division
PO Box 180
Jefferson City, MO 65101

David Strayer
Institute of Ecosystem Studies
P.O. Box AB
Millbrook, NY 12545
strayerd@ecostudies.org
914-677-5343
Fax: 914-677-5976

Carson Stringfellow
Columbus State University
P.O. Box 186
Waverly Hall, GA 31831
cstringfellow@mindspring.com

Bob Szafoni
Illinois DNR
1660 W. Polk Street
Charleston, IL 61920
rszafoni@dnrmail.state.il.us
217-345-2420
Fax: 217-348-5873

T

Richard Tankersley
Florida Institute of Technology
Dept. of Biological Sciences
Melbourne, FL 32901
rtank@fit.edu
321-674-8195

John Tetzloff
Ohio State Museum Biological Diversity
606 Woodbury Ave.
Columbus, OH 43223
jftetzloff@aol.com
614-276-4550

Pam Thiel
USFWS
W2645 Highway 33
La Crosse, WI 54601
pam_thiel@mail.fws.gov
608-783-8431
Fax: 608-783-8450

Fred G. Thompson
Florida Museum of Natural History
University of Florida
Gainesville, FL 32611-7800
fgt@flmnh.ufl.edu
352-392-6569
Fax: 352-392-9367

Richard Tippit
Nashville District Corps of Engineers
212 Glenwood Drive
Goodlettsville, TN 37072
615-736-2020
Fax: 615-736-7220
rntippit@aol.com

Linden Trial
Missouri Dept. of Conservation
1110 South College Ave.
Columbia, MO 65201
triall@mail.conservation.state.mo.us
573-882-9880 ext. 3229

V

Dan VanLeeuwen
11185 Highway 59
Erie, KS 66733
dvanleeuwen@excite.com
316-244-5183

Rita Villella
USGS/BRD
Leetown Science Center
1700 Leetown Road
Kearneysville, WV 25430
rita_villella@usgs.gov
304-724-4472
Fax: 304-724-4465

Gary Wagenbach
Carleton College
One North College Street
Northfield, MN 55057
507-646-4390
Fax: 507-646-5757
gwagenba@carleton.edu

Amy R. Wethington (student)
Univ. of Alabama
Dept. of Biological Sciences
Box 87035
Tuscaloosa, AL 35487
awething@biology.as.ua.edu
amywgs@juno.com

W

David Walker
Field Museum
218 So. Edgewood Ave.
LaGrange, IL 60525
708-482-7399
dhwallerr@hotmail.com

Barry Wicklow
Saint Anselm College
100 Saint Anselm Drive
Manchester, NH 03102-1310
603-641-7163
Fax: 603-641-7116
bwicklow@anselm.edu

Doug Warmolts
Columbus Zoo
9990 Riverside Drive
Box 400
Powell, OH 43065-0400
dwarmolt@colzoo.org
614-645-3400
Fax: 614-645-3465

James D. Williams
USGS
7920 NW 71st Street
Gainesville, FL 32605
jim_williams@usgs.gov
352-378-8181 ext.304
Fax: 352-378-4956

Mel Warren
Southern Research Station
USDA Forest Service
1000 Front Street
Oxford, MS 38655
fswarren@olemiss.edu
662-234-2744
Fax: 662-234-8318

Shi-Kuei Wu
University of Colorado
4145 Amber Street
Boulder, CO 80304
skwu@spot.colorado.edu
303-444-2306
Fax: 303-444-2306

Brian Watson
NC Wildlife Resources Commission
205 Cloverdale Drive
Durham, NC 27703
919-598-5093
Fax: 919-469-9100
watsonbt@ncmail.net

Z

Greg Zimmerman
EnviroScience, Inc.
3781 Darrow Road
Stow, OH 44224
gzimmerman@envirosienceinc.com
330-688-0111
Fax: 330-688-3858

G. Thomas Watters
Ohio State University
Aquatic Ecology Lab
1314 Kinnear Road
Columbus, OH 43212
gwatters@postbox.ac.s.ohio-state.edu
614-292-6170
Fax: 614-292-0181

Kurt Welke
Wisconsin DNR
3911 Fish Hatchery Road
Fitchburg, WI 53711
welkek@dnr.state.wi.us
608-275-7866

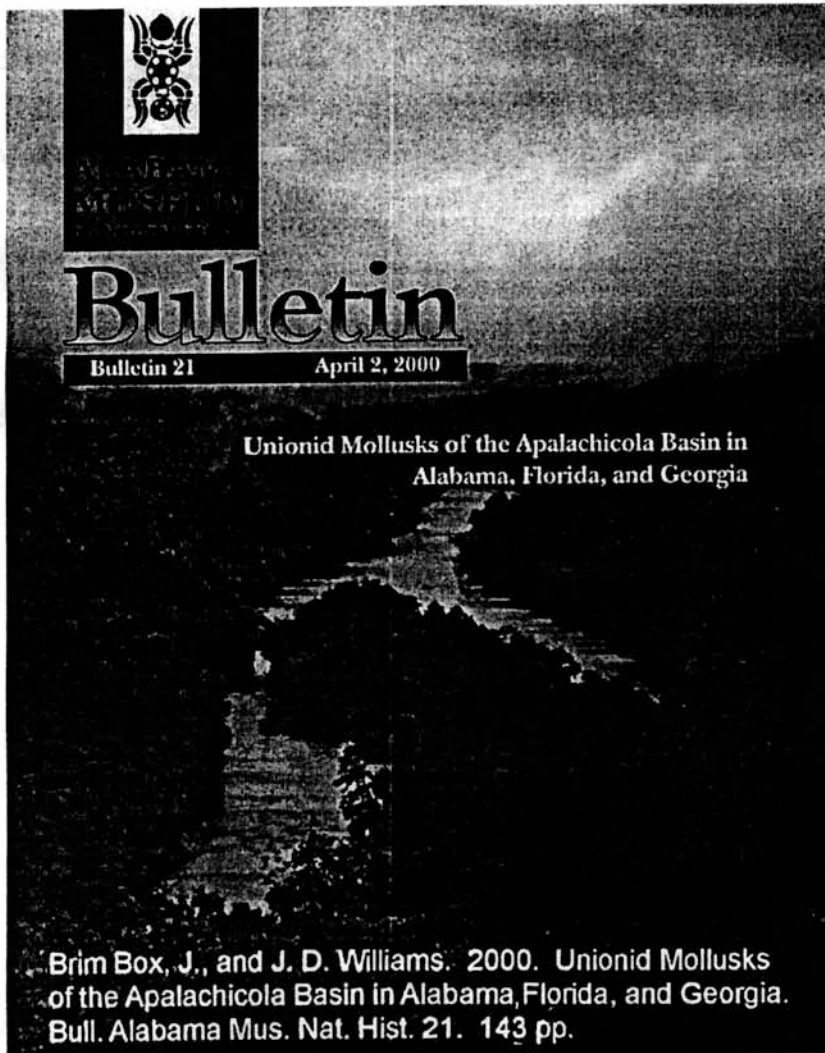
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Table of Contents

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Standing Committees and Chairs

If you are interested in assisting or learning more about any of the FMCS Standing Committees, please contact the appropriate chair at the address listed below.

Mussel Status and Distribution Atlas

Kevin S. Cummings
Illinois Natural History Survey
607 E. Peabody Dr.
Champaign, IL 61820
(217) 333-1623 Fax: 4949
ksc@inhs.uiuc.edu

Gastropod Status and Distribution Atlas

Robert S. Dillon
College of Charleston
Department of Biology
66 Charles Street
Charleston, SC 29424
(843) 953-8087 Fax: 5453
dillonr@cofc.edu

Symposium Committee

Thomas Proch
2721 Cedric Ave.
Pittsburgh, PA 15226
(412) 442-4051 Fax: 4328
tproch@stargate.net

Propagation, Restoration, and Introduction

Chris Barnhardt – co-chair
Southwest Missouri State University
Department of Biology
901 South National Avenue
Springfield, MO 65804
(417) 836-5166
mcb095@mail.smsu.edu

Richard Tankersley
Department of Biological Sciences
Florida Institute of Technology
Melbourne, FL 32901
(321) 674-8195
rtankers@fit.edu

Water Quality, Habitat Alteration and ZebraMussels

Bob Anderson
US Geological Survey
1000 Church Hill Road, Suite 200
Pittsburgh, PA 15205
(412) 490-3814 Fax: 3828
randerson@usgs.gov

Guidelines and Techniques

Heidi L. Dunn
Ecological Specialists Inc.
114 Algana Court
St. Peters, MO 63376
(636) 447-5355 Fax: 4101
ecologists@aol.com

Information Exchange

Mark Hove – interim chair
University of Minnesota
Department of Fisheries
1980 Folwell Ave.
St. Paul, MN 55108
(612) 624-3019 Fax: 625-5299
mark.hove@fw.umn.edu

Commercial

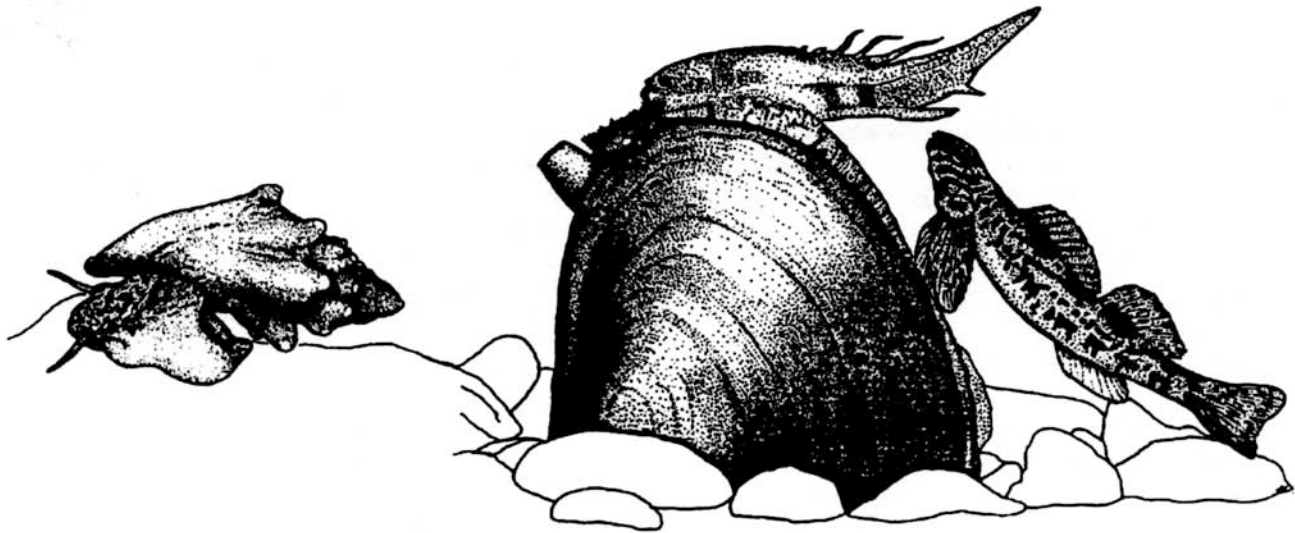
Steve A. Ahlstedt
1820 Midpark Drive
Knoxville, TN 37828
(865) 545-4140 Fax: 4496
ahlstedt@usgs.gov

Outreach

Kurt Welke – co-chair
Wisconsin - DNR
3911 Fish Hatchery Road
Fitchburg, WI 53711
(608) 275-3266
welkek@dnr.state.wi.us

Janet Butler – co-chair
USFWS
Ohio River Islands NWR
P.O. Box 1811
Parkersburg, WV 26102
(304) 422-0754
janet_butler@fws.gov

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