

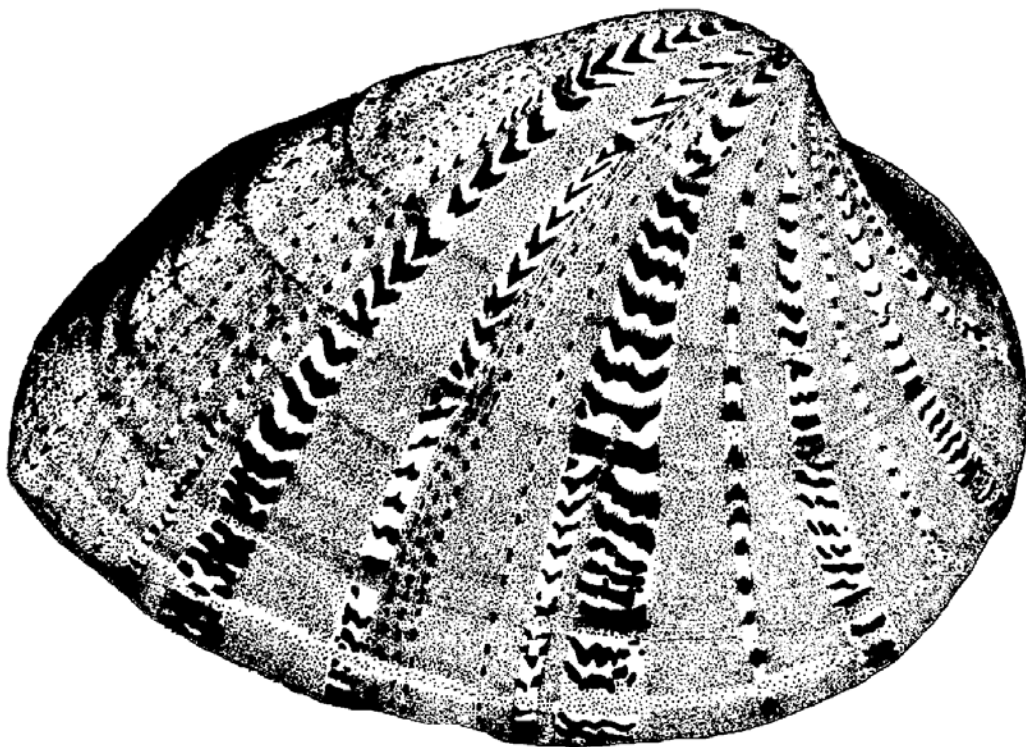
# *Ellipsaria*

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The Newsletter of the Freshwater Mollusk Conservation Society

Volume 12 - Number 1

April 2010



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Submissions for the August 2010 issue of *Ellipsaria* may be sent to the editor at any time but are requested by **July 30, 2010**. Anyone may submit an article but you must be a member of FMCS to receive *Ellipsaria*. Please limit submissions to about one page. Categories for contributions include news, new publications, meeting announcements, current issues affecting mollusks, job postings, contributed articles (including ongoing research projects), abstracts, and society committee reports. Electronic submissions are preferred; contact the editor with any questions. Note that submissions are not peer reviewed, but are checked for content and general editing.

***Please send change of address information to the Secretary.***

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# Ellipsaria

NEWSLETTER OF THE FRESHWATER MOLLUSK CONSERVATION SOCIETY

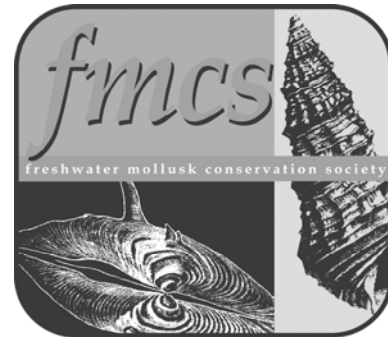
Volume 12, No. 1

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

April 2010

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**2010 FMCS Workshop**  
**Regional Fauna Identification & Sampling**  
**Kirkwood, Missouri**  
**October 19 - 21, 2010**  
*'Show-Me' your umbones!*

A panel of regional fauna experts representing Texas, Gulf Coast, upper Ohio Basin, Southeast U.S., Mobile Basin, Atlantic Slope, Cumberlandian, Interior Basin, Western U.S., and the Ozark regions will give presentations on mussels unique to their area, common species shared with other regions that "just look different here", and the ever popular "problem children". They will also give tips and pointers on unique collecting methods used in the region. Additional experts will give presentations on general freshwater mussel identification and sampling techniques. There will be ample time to view representative specimens from the regions, and time to spend discussing characters with the experts.

The workshop will be held at Missouri Department of Conservation's Powder Valley Conservation Nature Center (<http://www.mdc.mo.gov/areas/cnc/powder/>), located in a 112 acre oak-hickory forest just southwest of St. Louis in the lower Meramec River watershed. Following the workshop, field trips to the nearby Meramec River, Mississippi River and the U.S. Geological Survey's Columbia Environmental Research Center are planned.

The workshop is limited to 200 attendees. The early registration discount ends August 1.

Registration form, hotel link, and more information: [http://musselconservation.org/2010\\_Registration.html](http://musselconservation.org/2010_Registration.html)

For more information please contact Steve McMurray, [Stephen.McMurray@mdc.mo.gov](mailto:Stephen.McMurray@mdc.mo.gov); 573.882.9909, or Heidi Dunn, [hdunn@ecologicalspecialists.com](mailto:hdunn@ecologicalspecialists.com); 636.281.1982.

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**FMCS Board Meeting Minutes  
Conference Call  
April 22, 2010**

9:30-11:30 AM Eastern Time (8:30-10:30 Central)

Call to Order and Roll Call for Attendance (Greg Cope)

Greg Cope  
Heidi Dunn  
Andy Roberts  
Tony Brady  
Tom Watters  
Steve Ahlstedt  
Paul Johnson  
Leroy Koch  
David Berg  
Ryan Evans  
Greg Zimmerman  
Art Bogan  
Jeff Powell  
Rachel Mair

**Approval of 12-07-2009 Board Meeting Minutes**

A motion was proposed and carried to approve the 12-07-2009 board minutes (see December 2009 *Ellipsaria*).

**Treasurer Report – Heidi Dunn**

Since January 1, we have received \$115 in interest income, \$5225 from memberships, \$10 from sale of hats, and \$1585 in workshop pre-registration for a total income of \$6,934. Expenses include newsletters (\$1489), credit card fees (\$149), a donation for Frieda Schilling's memorial (\$100), and Walkerana set up costs (\$5250) for total expenses of \$6,988. This leaves a slight deficit of \$54.

**Secretary Report – Greg Zimmerman**

The 2010 membership database is now updated. One area that needs attention next is the committee membership. Anyone that wants to join a committee should email the committee chair and copy the secretary. Also, current committee members please continue to check your committee boxes on the 2010 registration forms.

**Committee Reports**

**2010 Workshop Update – Steve McMurray, Heidi Dunn, others.**

The workshop is really coming together; the committee has assembled taxonomic experts on major fauna groups from around the country. The committee was heading to the site later in the day to work out the logistics of the expected attendance at the facility, travel / shuttles, etc. The registration form can be downloaded from the new website:  
[http://www.musselconservation.org/2010\\_Registration.html](http://www.musselconservation.org/2010_Registration.html)

**2011 Symposium Update – Leroy Koch, Monte McGregor, Jacob Culp**

The Symposium will be April 12-14, 11<sup>th</sup> is a travel day. The hotel has been booked. We need to get the website updated with the next symposium, dates, theme, etc. Also, there should be a first Call for Papers in the August *Ellipsaria* newsletter.

**Outreach – Andy Roberts**

Much of the Outreach Committee's work has been on the new website. Andy Roberts is planning outreach activities during the workshop. The website ([www.musselconservation.org](http://www.musselconservation.org)) will be switched to live since it is basically ready to go. This domain will be eventually changed to [www.molluskconservation.org](http://www.molluskconservation.org) – we already own that domain. We need committee chairs to re-check website. Also – action item - EACH COMMITTEE SHOULD MAKE A STATEMENT OF PURPOSE and check favorite links, etc. Comments / revisions to website are due in 2-3 weeks.

**Action Item – Website**

Greg Zimmerman / Andy Roberts Determine status of FMCS web site revisions

- Review and incorporation of web comments
- Status / design of members-only section
- Timeline for transition

Committees- Information for Website Committee Pages

- List of individual projects / activities for each committee
- Add a link so that members can join a committee.

**Information Exchange – Tom Watters, John Jenkinson, Greg Cope**

The new Journal and how it will integrate within the new website was discussed. We will want the site to be indexed by BioOne. Regarding if the Science Citation index would track the citations, it was suggested to consult Caryn Vaughn and/or BioOne. Abstracts will be available to any user, full articles only to subscribers. Greg Zimmerman indicated he would put together a list of website requirements and investigate costs of implementation from a couple different sources. Costs for the journal will need to be finalized but will depend on the extent of web implementation required, etc.

Topics for discussion:

1. Review Board
2. When can we solicit manuscripts?

**Editorial Board appointments:** please send nominations to Tom Watters at [Watters.1@osu.edu](mailto:Watters.1@osu.edu) for the editorial board, including nominations for yourself!

Call for *Walkerana* papers should be advertised in the next *Ellipsaria* and on Unio.

**Call for Nominations for *Ellipsaria* Editor:** *Ellipsaria* will transition to electronic format. Paul Johnson was the original editor (1999-200) and Chris Mayer took over in 2000 until present. Great job Chris!!! The journal is ready to go to electronic format soon, and its time to tap a new editor. We will continue paper copies until the end of 2010. Please send nominations to Greg Cope.

**Information Exchange Report:** FMCS commissioned a graphic artist to design the template for *Walkerana* including covers and page design. This work has been completed and the Board approved a final version. The next step is to appoint an Editorial Board. FMCS can begin to solicit contributions as soon as the necessary websites are available that allow authors to upload and download their files. At that point, we will contact BioOne and begin integrating our website with theirs.

**Awards** – Teresa Newton, Emy Monroe, Greg Cope  
Nothing new to report

**Environmental Quality and Affairs** - Ryan Evans, Steve McMurray

The committee has recently developed two public comments for the society:

- 1) Comments on upcoming revisions to the Surface Mining and Reclamation Act (SMCRA) Evaluated changes to state – cumulative hydrological impacts from mining
- 2) Comments to EPA on the update of ammonia criteria for aquatic mollusks - Updating ammonia criteria – Tom Augspurger did a very good job!
- 3) Center for Biological Diversity (CDB). FMCS member Jim Williams assisted CDB with the package of aquatic species in their listing petition to the Department of the Interior.

**Gastropod Status and Distribution** - Paul Johnson, Jeff Powell

We need gastropod content for the website pages ASAP – Paul Johnson will provide.

**Genetics** - David Berg

Written report submitted. Working on a Best Practices, including type localities. Also looking at DNA bar coding in mollusks? There are only a few articles out there. Requested that Genetics committee is added to webpage. Dr. David E. Schindel Consortium for the Barcode of Life, National Museum of Natural History (Washington D.C.), could be a possible speaker for symposia.

Genetics Report: At the Baltimore meeting in 2009, the Genetics Committee discussed the following items:

1. There is a distinctive “split” in the duties of the Genetics Committee, with three main avenues of interest: systematics, population genetics, and aquaculture/captive propagation. The committee should be certain its activities are addressing all of these areas.
2. We desire further development of the use of DNA barcoding for identification of provisional species. Few (a Science Citation Index search of “DNA barcoding” & either mollusk, mussel, or snail revealed only one citation) papers have reported use of this methodology.
3. Further development of nondestructive tissue sampling techniques is desirable. Several papers have reported development of these techniques; we should work to standardize them.
4. Creation of best practices “1-pagers.” These short documents would address topics such as vouchering of specimens, value of sampling at type localities, DNA barcoding, genetic concerns in creation of captive, augmented, and restored populations, etc. We plan to start the first of these, focused on sampling of type localities and barcoding from these localities, through an online effort using Google Docs. This has not yet begun.

**Guidelines and Techniques** - Chuck Howard, Janet Clayton  
Not present / nothing to report

**Mussel Status and Distribution** - Arthur Bogan, Jim Williams

Highlight Tom Watters new website, with warning  
Jim Williams – FW mussels of Florida  
First map for SE Atlantic mussel atlas

Jim Williams and Art Bogan report the new feature of G. Thomas Watters OSUM website for the mapping of freshwater mussels.

[http://www.biosci.ohio-state.edu/~molluscs/OSUM2/Ohio\\_map.html](http://www.biosci.ohio-state.edu/~molluscs/OSUM2/Ohio_map.html)

This makes another major collection available for mapping of the collection contents. This still goes out with the caution that all museum identifications still need verification.

Jim Williams is in the final stages of drafting the Freshwater mussels of Florida with Bob Butler.

John Alderman and group have completed the first distribution map for the freshwater mussels of the South Atlantic mussel project.

**Propagation, Restoration, and Introduction** - Tony Brady, Rachel Mair

List of propagation facilities and capabilities still in the works.

**New/Continuing Business**

FMCS Appointment to ORBFHP Steering and Coordination Committee

FMCS is sending Brant Fisher as a representative of FMCS to the first ORBFHP meeting. Barb Douglas may take over the role as a representative for FMCS in the future.

**FMCS By-Laws Review**

A review of the By-Laws was conducted by the Board and a number of minor technical corrections were implemented. The revised version will be posted on the website.

**National Strategy Update**

FMCS needs to continue to work to revise the strategy. We are looking for a person to lead the effort that was involved since the beginning of the strategy to help with its revision. Please see Steve Ahlstedt of Greg Cope for details.

FMCS is looking for sponsors and topics for 2012 FMCS workshop and the host location for the 2013 FMCS symposium. Please contact a board member with proposals, sponsorship, etc.

*Submitted by Greg Zimmerman, FMCS Secretary*

**Membership Renewals**

*Membership dues are collected annually at the beginning of each year. If you haven't renewed for 2010, you'll see "2009" in the upper right corner of your mailing label.*

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## Obituary

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### Frieda Schilling

With extraordinary personal sadness, I report the passing of a shell collecting giant, Mrs. Frieda Schilling, a lifelong resident of St. Louis City and County Missouri. Born March 3, 1924, she passed away on January 19, 2010 after several years of declining health. She was preceded in death by her husband Omar in 2006. Omar worked in the 1960's on the original tread plates of the behemoth Transporters for the NASA Apollo and later Space Shuttle programs, which are still in use today. Frieda and her sister Hessie (Hedwig) were among seven children of a family of German immigrants. Frieda indicated with sister Hessie while their husbands were on fishing trips along the Ohio River near Paducah, Kentucky in the early 1960's, and other rivers and streams they would pick up freshwater mussels and gastropods. When the rivers were high, they would look for land shells. Their collecting data was always excellent, describing habitat, how the shells were found, and specifically the location. In those pre-GPS times, she would always annotate range and township locations from local maps and how to access the collecting site. She often preserved live material as well as the shells.



Hessie and Frieda had a scientific inclination to identify and classify shells of freshwater mollusks when those shells were not popular to collect. They corresponded with Alan Solem (Field Museum, Chicago), Bill Clench (Harvard) and David Stansbery of Ohio State for shell identifications. The sisters would assign their own common name to the shells collected until they could be identified scientifically, such as "Big Browns" for *Actinonaias ligamentina* and "Raspberry and Purples" for the brilliant color of the interior nacre for *Leptodea leptodon*. Though a poor swimmer, Frieda and Hessie would not hesitate to cross rivers in a small rubber raft to collect shells. They attended many American Malacological Union (now Society) meetings where Bill Clench would

warmly greet them as "My freshwater collecting friends from Missouri." They also collected with David H. Stansbery, R. Tucker Abbott and Constance (Connie) Boone among others. Hessie's collection was donated to the American Museum of Natural History in New York and Frieda's collection of over 200 genera was donated to the Field Museum, although she also provided material to the Ohio State Museum, and some wet material is in the Florida Museum of Natural History.

Frieda inspired and was a mentor to many of us in the St. Louis Shell Club as she would consistently win the DuPont Awards at our shell shows (this was pre COA Awards) with small but well documented freshwater or land shell displays. I believe she and her sister were among the last to collect *Epioblasma florentina curtisi* (Frierson & Utterbach, 1914) along the Black River, Missouri and the Spring River in northern Arkansas. Of the Black River location, she related the shell was never common and in swift current in an area that was later dredged while putting in an overhead power line destroying the habitat.

She was honored by the Freshwater Mollusk Conservation Society's 2<sup>nd</sup> National Symposium in Pittsburgh in 2001 with the William J. Clench Award "for her exemplary contributions to the science of freshwater malacology, emphasizing field collections, sharing information with others in the field and her making her collection widely available by depositing them in museums."

We seldom see quiet individual workers who have made such a contribution to freshwater malacology such as her, and she will be missed.

*Alan Gettleman*



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## Announcements & News

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### 102 Years of Expertise Directed at Tar River Spiny mussel Conservation

The Raleigh Field Office hosted two meetings of 15 experts to gather and synthesize what is known about the Tar River Spiny mussel (*Elliptio steinstansana*), a federally-endangered freshwater mussel and a North Carolina endemic. Under the leadership of key partners including Sarah McRae (freshwater ecologist with the NC Natural Heritage Program), Rob Nichols (Eastern Aquatic Wildlife Diversity Coordinator with the NC Wildlife Resources Commission) and John Fridell (the FWS's lead for Tar River spiny mussel recovery), the group reviewed Tar River spiny mussel biology, current and historic distribution, suitable habitat conditions, and worked towards an expert-based estimate of how much habitat to protect (along with where, and how) to conserve the species. Future instream and landscape level monitoring and research are expected to allow design refinements. A report on the effort is expected early this summer. The group possessed over 100 years of combined expertise with this species, including perspectives from biologists with other agencies, consulting firms, and academic institutions. We were particularly fortunate to have Dick Biggins, the biologist who handled listing of this species as endangered in 1985 (and a 2002 FWS Endangered Species Recovery Champion) join us from retirement. The FWS is grateful to all the participants for devoting their time and energy to fostering the recovery of the Tar River spiny mussel. For more information, please contact Tom Augspurger (919/856-4520 x21 or tom\_augspurger@fws.gov).



Participants in the Tar spiny mussel sanctuary design meeting included (L to R) Tim Savidge (The Catena Group), Dick Biggins (FWS-retired), Tom Dickinson (The Catena Group), Art Bogan (NC Museum of Natural Science), and Chris Eads (NC College of Veterinary Medicine). Not pictured are John Alderman (Alderman Environmental Services), Sarah McRae, Angie Rodgers and Judy Ratcliffe (NC Natural Heritage Program), Logan Williams and Jason Mays (NC Department of Transportation), Chris Wood and Rob Nichols (NC Wildlife Resources Commission), John Fridell and Tom Augspurger (FWS).

*Submitted by Sarah McRae*

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### Brief Overview of the SE Atlantic Slope Meeting, January 2010

The second biennial Southeast Atlantic Slope Mollusk Meeting was held in Raleigh, NC on January 27-28, 2010. The meeting organizers included: Sarah McRae and Angie Rodgers of the NC Natural Heritage Program, Brian Watson of the Virginia Department of Game and Inland Fisheries, Jason Wisniewski of the Georgia Department of Natural Resources and Eric Krueger of The Nature Conservancy. Nearly 60 people from VA, NC, SC, GA, and TN attended a two day meeting to discuss a wide range of topics, from mussel taxonomy and sampling protocols to listing packages and conservation banks and even the health of aquatic biologists. A very detailed summary of the meeting is available – contact Sarah McRae at sarah.mcrae@ncdenr.gov for more information.

*Submitted by Sarah McRae*

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### AFS Letter Regarding The Endocrine Disruption Prevention Act

President Barack Obama  
1600 Pennsylvania Avenue  
Washington, DC

May 3, 2010

Dear Mr. President:

As Executive Director of the 9000 member American Fisheries Society (AFS), I urge you to support and eventually sign The Endocrine Disruption Prevention Act of 2009, introduced by Congressman Jim Moran (HB 4190) and Senator John Kerry (S2828). Our members have published many of the scientific studies indicating that endocrine disrupting chemicals are found throughout the Nation, including in high elevation and high latitude National Parks in the western U.S. These chemicals have resulted in the feminization of male fish at biochemical, cell, tissue, organ, and behavioral levels of biological organization. In some waters, fishery scientists can find no male fish. This has serious implications for the persistence of those fish populations and the people that depend on them for food, recreation, and income. Similar conditions have been observed in aquatic amphibians. And endocrine disrupting chemicals have the same effects on all vertebrates, especially if they occur in the blood and amniotic fluid of pregnant females or in daily work environments (e.g., of industrial, agricultural, or service workers).

Other scientific studies have shown that low-level exposures to endocrine disrupting chemicals are linked to many human disorders and diseases. These endocrine-related disorders place a huge burden on our families, our health care system, and our economy.

The AFS believes that the National Institutes of Health-Environmental Health Division, through its intramural and extramural research programs, has the capacity to advance and broaden the knowledge about endocrine disruption; to use that knowledge to develop comprehensive assays that can detect multiple endocrine disrupting outcomes; and to determine the level of concern regarding the potential to disrupt human and other vertebrate endocrine systems. With this information,

regulatory agencies will be able to establish the health- and environmentally-protective measures that are so urgently needed. The main purpose of the program proposed in the bill is to develop reliable and reproducible methods to identify chemicals that can disrupt the vertebrate endocrine system. These protocols will:

- 1) address the full range of possible health outcomes (including reproductive, behavioral, intellectual, metabolic, and endocrine disorders);
- 2) be sensitive enough to detect effects at exposure levels relevant to human and aquatic vertebrate exposure (and not rely on the assumption that a lower dose produces less effect); and
- 3) consider the effects of exposure to multiple chemicals.

For these reasons, as well as others outlined in the proposed Act, I again urge you to actively support and eventually sign this critical legislation.

Sincerely yours,

Ghassan Rassam,  
Executive Director, AFS  
Cc/Sen. Kerry  
Congressman Moran

Submitted by Jeremy Tiemann with permission of author

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## The Ohio State University, Division of Molluscs: iUNIO

The Division of Molluscs at The Ohio State University has a new mapping feature, iUNIO, which plots species distributions for North American freshwater mussels along with catalog information:

<http://www.biosci.ohio-state.edu/~molluscs/OSUM2/>

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## Publications

**Delvene, G., & Araujo, R. 2009.** Early Cretaceous non-marine bivalves from Spain. *Journal of Iberian Geology*, 35(1): 19-34.

**Bermúdez-Rochas, D., Delvene, G. & Araujo, R. 2009.** Importancia de los peces en la dispersión de los bivalvos en el registro fósil. Un ejemplo en el Cretácico Inferior de la Cuenca de Cameros (España). *Actas de las IV Jornadas Internacionales sobre Paleontología de dinosaurios y su entorno*. Salas de los Infantes, Burgos: 179-185.

**Pou-Rovira, Q., Araujo, R., Boix, D., Clavero, M., Feo, C., Ordeix, M., and Zamora, L. 2009.** Presence of the alien species Chinese pond mussel *Anodonta woodiana* (Lea, 1834) in the Iberian Peninsula. *Graellsia*, 65(1): 67-70.

**Reis, J., & Araujo, R. 2009.** Redescription of *Unio tumidiformis* Castro, 1899 (Bivalvia: Unionoidea), an endemism from Southwestern Iberian Peninsula. *Journal of Natural History*, 43(31-32): 1929-1945.

**Delvene, G., & Araujo, R. 2009.** *Protopleurobema*: a new genus of freshwater bivalve from the Lower Cretaceous of the Cameros basin (NW Spain). *Journal of Iberian Geology*, 35(2): 169-178.

**Araujo, R., Reis, J., Machordom, A., Toledo, C. Madeira, M.J., Gómez, I., Velasco, J.C., Morales, J., Barea, J.M., Ondina, P. & Ayala, I. 2009.** Las náyades de la península Ibérica. *Iberus*, 27(2): 7-72.

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**Kelly, C.B., & G.T. Watters. 2010.** Distribution and prevalence of glochidia-infested wild-caught fishes at a Muskingum River site in southeastern Ohio. *Journal of Freshwater Ecology* 25: 119-126.

**Watters, G.T., & C.J.M. Flaute. 2010.** Dams, zebras, and settlements: the historical loss of freshwater mussels in the Ohio River mainstem. *American Malacological Bulletin* 28: 1-12.

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**Agudo-Padrón, A.I. 2008.** Listagem sistemática dos moluscos continentais ocorrentes no Estado de Santa Catarina, Brasil. *Comunicaciones de la Sociedad Malacológica del Uruguay*, Montevideo, 9(91): 147-179. Available online at: <http://redalyc.uaemex.mx/redalyc/pdf/524/52412049003.pdf> (in Portuguese with English abstract).

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## Contributed Articles

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

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### Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel *Sinanodonta woodiana*. 21. News from Belgium, Poland, Spain and Ukraine

Henk K. Mienis  
National Collections of Natural History, Department of  
Zoology, Tel Aviv University, IL-69978 Tel Aviv and  
National Natural History Collections, Berman Building,  
Hebrew University of Jerusalem, IL-91904 Jerusalem, Israel.  
[mienis@netzer.org.il](mailto:mienis@netzer.org.il)

In the past couple of months some new aspects dealing with the Chinese Pond mussel *Sinanodonta woodiana* (Lea, 1834) in Europe have been published. The most important data are here given in a concise form.

#### Belgium

Recently two new records of *Sinanodonta woodiana* have been published on the website <http://waarnemingen.be/>. On 22 September 2009, R. Barendse found this species in fishponds near Schulenbroek, Schallebroek, Limburg. His record was



accompanied with some photographs which showed almost complete round specimens. Ten days later, on 2 October 2009, J. Auwerx saw specimens near Wijverheide-South, Limburg. Both localities are part of or close to the fishponds in Zonhoven, where this alien species had already been found (see Mienis, 2009).

### Poland and Ukraine

Yuryshynets & Krasutska (2009) reported recently the presence of the parasitic worm *Aspidogaster conchicola* in specimens of the Chinese Pond mussel from the Konin Lakes in Poland and the Danube Delta in Ukraine. The invasion rates varied between 5 and 30% and the parasitized mussels contained 1-2 worms per specimen.

### Spain

This invasive mussel species has reached also the Iberian Peninsula. Pou-Rovira et al. (2009) reported it from the rivers Ter (5 localities), Fluviá (1 locality) and Daró (2 localities) in N.E. Spain. The first specimens had been found already in 2006 during a study of fish communities in the lower section of the river Ter. However, only two years later the mussels were recognized as belonging to the invasive Chinese Pond mussel. Four autochthonous large freshwater mussels are known to live in the rivers Ter and Fluviá. The populations of these species have undergone a strong decline in the last decades. Competition with the exotic *Sinanodonta woodiana* may even deteriorate the situation.

### References

- Mienis, H.K., 2009. Additional information concerning the conquest of Europe by the invasive Chinese Pond Mussel *Sinanodonta woodiana*. 20. News from Belgium. *Ellipsaria*, 11 (2): 5-6.
- Pou-Rovira, Q., Araujo, R., Boix, D., Clavero, M., Feo, C., Ordeix, M. & Zamora, L., 2009. Presence of the alien Chinese pond mussel *Anodonta woodiana* (Lea, 1834) (Bivalvia, Unionidae) in the Iberian Peninsula. *Graellsia*, 65 (1): 67-70.
- Yuryshynets, V. & Krasutska, N., 2009. Records of the parasitic worm *Aspidogaster conchicola* (Baer 1827) in the Chinese pond mussel *Sinanodonta woodiana* (Lea 1834) in Poland and Ukraine. *Aquatic Invasions*, 4 (3): 491-494.

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## A Third Compilation of a List of Predators of Freshwater Molluscs in Israel and Palestine

Henk K. Mienis

National Collections of Natural History, Department of Zoology, Tel Aviv University, IL-69978 Tel Aviv and National Natural History Collections, Berman Building, Hebrew University of Jerusalem, IL-91904 Jerusalem, Israel. mienis@netzer.org.il

Freshwater molluscs play an important role in the food chain of many other animals, yet little information has been published about this subject in the Levant. For example, most records of predation on aquatic molluscs have appeared in the form of short faunistic notes, often in journals hardly available to the general public. This is a third attempt to summarize the published and unpublished information dealing with predation

on freshwater molluscs in Israel and Palestine. Since the first (Mienis, 2004) and second compilation (Mienis, 2009), I have come across some older publications dealing with the food of some freshwater fish species occurring in Israel. The records dealing with molluscs are incorporated in this third compilation. I hope sincerely that this list will lead to a stream of additional records.

### Predators of freshwater molluscs in Israel and Palestine

#### Family NERITIDAE

*Theodoxus (Neritaea) jordani jordani* (Sowerby, 1836)  
Catfish - *Clarias gariepinus* (Spataru, Viveen, Gophen, 1987)  
Starling - *Sturnus vulgaris* (Mienis, 2004).

*Theodoxus (Neritaea) karasuna* (Mousson, 1874)  
Damascus barbel - *Capoeta damascina* (Mienis, 2004).

*Theodoxus (Neritaea) michonii* (Bourguignat, 1852)  
Rainbow trout - *Oncorhynchus mykiss* (Mienis, 2004);  
Levantine dace - *Pseudophoxinus kervillei* (Mienis, 2004);  
Josephus cichlid - *Astatotilapia flavijosephi* (Mienis, 2004);  
Mediterranean Hooded Crow - *Corvus corone sardonius* (Aharoni, 1938).

*Theodoxus (Neritaea)* species  
Rainbow trout - *Salmo gairdneri* (Degani et al., 1987)

#### Family COCHLIOPIDAE

*Heleobia (Semisalsa) contempta* (Dautzenberg, 1894)  
Josephus cichlid - *Astatotilapia flavijosephi* (Mienis, 2004).

#### Family BITHYNIIDAE

*Bithynia phialensis* (Conrad, 1852)  
Levant freshwater crab - *Potamon potamios*\* (Mienis, unpublished);  
Catfish - *Clarias gariepinus* (Spataru, Viveen, Gophen, 1987)  
Rainbow trout - *Oncorhynchus mykiss* (Mienis, 2004);  
Damascus barbel - *Capoeta damascina* (Mienis, 2004);  
Josephus cichlid - *Astatotilapia flavijosephi* (Mienis, 2004);  
Starling - *Sturnus vulgaris* (Mienis, 2004).

*Bithynia* species  
Rainbow trout - *Salmo gairdneri* (Degani et al., 1987)

#### Family THIARIDAE

*Melanoides tuberculatus* (Müller, 1774)  
Leech - *Helobdella triserialis* (as *H. punctatolineata*) (Mienis, 1986a);  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004);  
Catfish - *Clarias gariepinus* (Spataru, Viveen, Gophen, 1987)  
Damascus barbel - *Capoeta damascina* (Mienis, 2004);  
Glossy ibis - *Plegadis falcinellus* (Mienis, 1997; Ashkenazi & Dimentman, 1998);  
Starling - *Sturnus vulgaris* (Mienis, 2004);  
Mediterranean Hooded Crow - *Corvus corone sardonius* (Aharoni, 1938 as *Melania*).

*Tarebia granifera* (Müller, 1774)  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2009)

*Thiara scabra* (Müller, 1774)  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2009)

#### Family MELANOPSIIDAE

*Melanopsis buccinoidea* (Olivier, 1801)

Levant freshwater crab - *Potamon potamios*\* (Mienis, 2003);  
Fire (or Spotted) Salamander - *Salamandra salamandra*  
(Degani & Mendelssohn, 1979 as *M. praemorsa*);  
Rainbow trout - *Oncorhynchus mykiss* (Mienis, 2004);  
Damascus barbel - *Capoeta damascina* (Mienis, 2004);  
Starling - *Sturnus vulgaris* (Mienis, 2004);  
Brown-necked raven - *Corvus ruficollis* (Aharoni, 1938 as  
*M. praemorsa*).

*Melanopsis cerithiopsis* Bourguignat, 1884  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004);  
Starling - *Sturnus vulgaris* (Mienis, 2004).

*Melanopsis costata costata* (Olivier, 1804)  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004);  
Josephus cichlid - *Astatotilapia flavijosephi* (Mienis, 2004);  
Starling - *Sturnus vulgaris* (Mienis, 2004).

*Melanopsis costata jordanica* Roth, 1839  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004);  
Yellow-vented bulbul - *Pycnonotus xanthopygos* (Mienis,  
1994b as *M. praemorsa jordanica*).

*Melanopsis lampra* Bourguignat, 1884  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004);

*Melanopsis spec.*  
Rainbow trout - *Salmo gairdneri* (Degani et al., 1987)  
European coot - *Fulica atra* (Ashkenazi & Dimentman, 1998  
as *M. praemorsa*)

#### Family VALVATIDAE

*Valvata (Cincinna) saulcyi* Bourguignat, 1853  
Rainbow trout - *Oncorhynchus mykiss* (Mienis, 2004);  
Starling - *Sturnus vulgaris* (Mienis, 2004).

*Valvata (Cincinna) species*  
Rainbow trout - *Salmo gairdneri* (Degani et al., 1987)

#### Family PHYSIDAE

*Haitia acuta* (Draparnaud, 1805)  
Leech - *Helobdella triserialis* (as *H. punctatolineata*) (Mienis,  
1986a as *Physella acuta*);  
Banded newt - *Triturus vittatus* (Mienis, 2004 & 2007);  
Rainbow trout - *Oncorhynchus mykiss* (Mienis, 2004);  
Levantina frog - *Rana levantina* (Mienis, 1996 as *Physella*  
*acuta*);  
Lapwing - *Vanellus vanellus* (Mienis, 1985 as *Physella acuta*);  
Black-winged stilt - *Himantopus himantopus* (Mienis, 1994a  
as *Physella acuta*);  
Green sandpiper - *Tringa ochropus* (Mienis, 1986b as *Physella*  
*acuta*).

*Stenophysa marmorata* (Guilding, 1828)  
Leech - *Helobdella triserialis* (Mienis, 2009)

#### Family PLANORBIDAE

*Bulinus (Isidora) truncatus* (Audouin, 1826)  
Green Sandpiper - *Tringa ochropus* (Mienis, 1986b).

*Gyraulus (Gyraulus) piscinarum* (Bourguignat, 1852)  
Rainbow trout - *Oncorhynchus mykiss* (Mienis, 2004).

*Planorbella duryi* (Wetherby, 1879)  
Leech - *Helobdella triserialis* (as *H. punctatolineata*) (Mienis,  
1986a as *Helisoma duryi*).

*Planorbis* species  
Green Sandpiper - *Tringa ochropus* (Cockburn, 1946).

#### Family LYMNAEIDAE

*Pseudosuccinea columella* (Say, 1817)  
Leech - *Helobdella triserialis* (as *H. punctatolineata*) (Mienis,  
1986a);  
Moorhen - *Gallinula chloropus* (Mienis, 1987);  
Green sandpiper - *Tringa ochropus* (Mienis, 1990).

#### Family unknown

Stylommatophoran snails (either *Haitia*, *Bulinus* and/or  
*Gyraulus*)  
Caspian terrapin - *Mauremys caspica rivulata* (Sidis & Gasith,  
1985).

#### Gastropods

Barbel - *Tor canis* (Spataru & Gophen, 1985a)  
Josephus cichlid - *Astatotilapia (Haplochromis) falvijosephi*  
(Spataru & Gophen, 1985b)  
Rainbow trout - *Salmo gairdneri* (Degani et al., 1987)  
Moorhen - *Gallinula chloropus* (Ashkenazi & Dimentman,  
1998).

#### Family UNIONIDAE

*Unio mancus eucirrus* Bourguignat, 1857  
Moorhen - *Gallinula chloropus* (Mienis, 2004).

*Unio terminalis delicatus* Lea, 1863  
Kingfishers - either *Halcyon smyrnensis* or *Ceryle rudis*  
(Mienis, 2004).

*Unio terminalis terminalis* Bourguignat, 1852  
Moorhen - *Gallinula chloropus* (Mienis, 2004);  
Mediterranean Hooded Crow - *Corvus corone sardonius*  
(Mienis, 2004).

#### Family Corbiculidae

*Corbicula consobrina* (Cailliaud, 1823)  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004).

*Corbicula fluminalis* (Müller, 1774)  
Levant freshwater crab - *Potamon potamios*\* (Mienis, 2004).  
Catfish - *Clarias gariepinus* (Yaron Krotman, unpublished)

\* So far only one species of freshwater crabs has been reported  
from Israel and Palestine (*Potamon potamios* s.l.), however,  
according to Dr. Sh. Ashkenazi (pers. com.) two  
morphological types seem to occur among these crabs.

#### Acknowledgements

I like to thank the students of Prof. Menachem Goren (Tel  
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in the intestines of freshwater fishes.

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## A first Record of a *Physella virginea*-like snail from Israel

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Only recently I studied a sample of land and freshwater molluscs collected in Nahal Poleg, an artificial stream in the Mediterranean coastal area of Israel on 7 September 1988. The material consisted of a mixture of empty shells of recent and sub-fossil specimens. To my surprise I found among the heterogeneous material a single, well preserved shell of a species belonging to the Physidae (TAU MO 68887).

According to the shell characters this shell is completely identical to a Physid species illustrated by Taylor (2003: Plt. 11, fig. 5) from the type locality of *Physa virginea* Gould, 1847, and rather unlike a form of the rather variable invasive *Haitia acuta* (Draparnaud, 1805), which is today the most common freshwater snail in Israel.

According to Taylor (2003: 250) *Physa virginea* has to be considered a junior synonym of *Physella gyrina* (Say, 1821). The latter may vary in form from depressed globose to high-spired slender shells. That invasive species is known to occur in the Botanical (TAU MO 51395) and Zoological Garden (TAU MO 51396) of the Tel Aviv University, Israel, but specimens belonging to those populations show a complete different shell morphology.

On the other hand, a web-site search with the help of "Google" has revealed that *Physella virginea* or Sunset physa (Turgeon et al., 1998: 135) is considered still a full species by many authors.

In order to solve the problem of the true identity of the *Physella virginea*-like snail from Nahal Poleg it is necessary to discover the source of this exotic species in the drainage area of that stream. This might be the large artificial pool near Yaquim, which drains into Nahal Poleg. In this pool numerous exotic aquatic plants are growing, which might serve as hosts for this puzzling Physid species.

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## Effects of the August 2007 Flood on Translocated Mussels, South Fork of the Zumbro River, Rochester, MN, August 2008

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Prior to construction of a sewer trunk line in Rochester, MN, six potential river crossing sites were surveyed for state listed mussels in 2005 in the South Fork of the Zumbro River. In 2006 over 600 living mussels were translocated from four sites, including Minnesota state listed mussel species: *Alasmidonta marginata* (20.0%), *Lasmigona costata* (nearly 2.0%), and *L. compressa* (2.3%). There was at least modest reproduction of most mussel species. Nearly all state listed mussels (24.4% overall) were externally aged, measured, and etched with unique numbers on both valves. Common species were hash-marked on both anterior valves. Moved to the upstream Translocation Site were 404 mussels from Site 1 (18.07% state listed mussels); 136 from Site 2 (44.85% listed), while 33 (15.15% listed), and 31 (22.58% listed) were from Sites 3 and 4 respectively. In 2007 there was a 95.1% survival of 83 numbered state listed mussels, and 85.3% survival of 68 hash-marked common mussels.

During the last required follow-up in 2008, dead and live mussels recovered from the Translocation Site included 86 numbered state listed mussels (90.7% survival), 56 hash-marked common mussels (96.3% survival), and 31 unmarked mussels (including five live listed mussels). Of the surviving numbered mussels, 64.1% did not show any change in size, or even a decrease in growth from 2007 to 2008. Only 35.8% of the numbered mussels showed some growth in 2008. We had never seen this phenomenon previously, and concluded that possibly this was a result of the record area flooding shortly after the 2007 follow-up (excessive turbidity and/or acidic conditions from upstream waterfowl). 17 numbered mussels not found in 2007 were found in 2008.

2008 Results: Mussel Species	Numbered	Marked	Unmarked	Total
<i>Pyganodon grandis</i>		2	2	4
<i>Anodontooides ferussacianus</i>			2	2
<i>Strophitus undulatus</i>		21	1	22
<b><i>Alasmidonta marginata</i></b>	<b>71</b>	<b>1</b>	<b>4</b>	<b>76</b>
<i>Lasmigona c. complanata</i>			2 D	2D
<b><i>Lasmigona costata</i></b>	<b>13</b>		<b>1</b>	<b>14</b>
<b><i>Lasmigona compressa</i></b>	<b>2</b>			<b>2</b>
<i>Leptodea fragilis</i>		2	3	5
<i>Lampsilis siliquoidea</i>			1	1
<i>Lampsilis cardium</i>		30	15	45
Total mussels (alive and dead):				173
Total live mussels:	78	54	29	161
Total dead mussels:	8	2	2	12
Total listed mussels / % survival:	86; 90.7%	1	5	92
Total species:	3	6	9	10

### Mollusk fauna of Santa Catarina's State, SC, Southern Brazil region: 14 years synthesis of knowledge and research

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Constituting a new registration of limnic bivalve species for the inventory, on August 05, 2009 one lot holding 10 specimens of native freshwater clams *Cyanocyclas* (= *Neocorbicula*) *limosa* (Maton, 1809) (VENEROIDA: CORBICULIDAE) was collected for the first time by us in the "Lageado dos Fragosos" (Fragosos River), a typical rocky stream belonging to the Uruguay River Basin, located in the Municipal District of Concórdia, West region of Santa Catarina's State. The specimens obtained like this were preserved (dry shells) and deposited in the Augusto Rushi Zoobotanical Museum (MUZAR), Passo Fundo University, Rio Grande do Sul State - RS.

Previous registrations of freshwater mollusks to this same place (total of 28 specimens distributed in 7 lots), jointly examined by us and the malacologist Prof. MsC Kay Saalfeld on April 16, 2003, in the laboratories of the Center of Ecology and Zoology of the Santa Catarina's Federal University – UFSC, obtained by field researchers to the "Environment National Program II – PNMA II", include the species *Aplexa marmorata* Guilding, 1828 (PHYSIDAE) – re-collected by us in the locality on August 05, 2009, *Anodontites ferrarisi* (d'Orbigny, 1835) (MYCETOPODIDAE), *Corbicula fluminea* (Müller, 1774) (CORBICULIDAE), and *Eupera platensis* Doello-Jurado, 1921 (SPHAERIIDAE), besides some little freshwater crabs (*Aegla* sp) and other aquatic invertebrates.

Continuing our malacological research trip for the Uruguay River Basin region on August 06, 2009, we accomplished a strategic visit to the Museu Entomológico Fritz Plaumann (*Fritz Plaumann Entomological Museum*), located in the green valley of “Nova Teutônia”, Municipal District of Seara, historical stronghold of German colonization in the West of the State, that he comes as the place geographical holder of the largest number of registrations of continental species contained in the examined literature (Agudo-Padrón 2008: 8), with 19 recognized forms: one Bivalvia & 18 Gastropoda – two freshwater and 16 terrestrial, microsnails in his majority.

During our visit we had the opportunity to check, to examine, to document and still to photograph the magnificent regional material of freshwater and terrestrial mollusks deposited in his scientific collection of natural history, properly conditioned and exposed beside countless other invertebrate types: GASTROPODA *Asolene (Pomella) megastoma* (Sowerby, 1825)\* (AMPULLARIIDAE), *Littoridina australis* (d'Orbigny, 1835)\*\*, *L. charruana* (d'Orbigny, 1840), *Potamolithus catharinae* Pilsbry, 1911 & *P. lapidum* (d'Orbigny, 1835)\*\* (HYDROBIIDAE), *Chilina fluminea* (Maton, 1809) & *C. parva* Martens, 1868 (CHILINIDAE), *Aplexa marmorata* Guilding, 1828 (PHYSIDAE), *Lymnaea rupestres* Paraense, 1982 (LYMNAEIDAE), *Acrorbis petricola* Odhner, 1937 & *Drepanotrema pfeifferi* (Strobel, 1874) (PLANORBIDAE), *Mesembrinus interpunctus* (Martens, 1887) & *Naesiotus eudioptus* (Ihering in Pilsbry, 1897) (BULIMULIDAE), *Megalobulimus gummatu* (Hidalgo, 1870) (MEGALOBULIMIDAE), *Cyclodontina tudiculata* (Martens, 1868) & *Macrodontes fasciatus* (Pfeiffer, 1869) (ODONTOSTOMIDAE), *Bradybaena similaris* (Férussac, 1821) (BRADYBAENIDAE), *Happiella grata* (Thiele, 1927)\*\* (SYSTROPHIIDAE), *Radiodiscus bolachaensis* Fonseca & Thomé, 1994 & *R. costellifer* Scott, 1957 (CHAROPIDAE), *Zonitoides arboreus* (Say, 1816)\*\* (GASTRODONTIDAE); BIVALVIA *Anodontites elongatus* (Swainson, 1823)\*\* & *A. patagonicus* (Lamarck, 1819) (MYCETOPODIDAE), *Diplodon multistriatus* (Lea, 1834) (HYRIIDAE) and *Pisidium globulus* Clessin, 1888 (SPHAERIIDAE).

\* Regional occurrence previously registered in the literature (Darwich *et al* 1989; Agudo-Padrón 2008: 9) ...

\*\* New species registration for the State ...

Between November 2008 and September 2009, and once again with the opportune and it activates participation in field of the husbands colleagues Ieda Elisabeta Schaefer Scheid and Mário Scheid, most other 88 terrestrial and limnic/freshwater copies de mollusks were examined (with incorporation of three new confirmed terrestrial species for the State), starting from the agricultural community site of “Linha Ervalzinho”, located in the Municipal District of São João do Oeste, Extreme West region of Santa Catarina's State, domain of the great Uruguay River Basin and territory of the “Arroio Dourado (Gold Stream) microbasin (Agudo 2008: 10) (Fig. 1.a. - Map), with headquarters in the lands property of Roque Anselmo Schaefer.

Most recently, in January 19 2010, and with the opportune participation in the field of the colleague Paulo Lenhard (Canoas, RS State), one other specime of terrestrial gastropod species, the tree forest snail *Mesembrinus interpunctus* (Martens, 1887) (BULIMULIDAE) (Fig. 1), are reported from the locality of “Sede Capela”, Itapiranga Municipal District, domain of riverine (ciliar) tropical damp forest in the Uruguay River Basin, preserved and deposited in the Museum of Natural Sciences of the Lutheran University of Brazil - MCNU (Universidade Luterana do Brasil), Canoas, Rio Grande do Sul State.

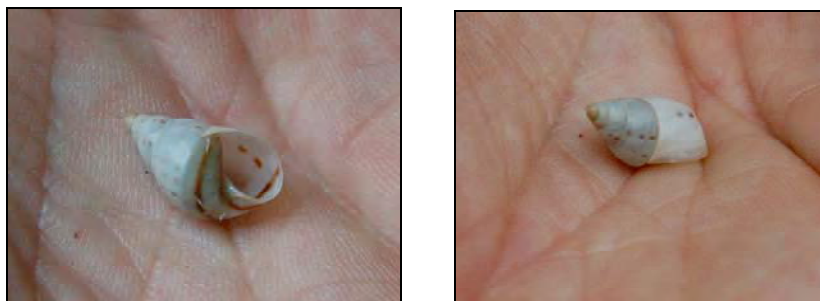


Figure 1. Tree native snail *Mesembrinus interpunctus* (Martens, 1887), first registration of this species from the Extreme West of the State. Photos: Paulo Lenhard



Figure 1.a. Terrestrial snails *Macrodontes thielei* Pilsbry, 1930 (ODONTOSTOMIDAE) (left) and *Streptaxis pfeifferi* (Pilsbry, 1930) (STREPTAXIDAE) (right), new records of native species from Santa Catarina's State in the Extreme West region (map). Photo: A. I. Agudo-Padrón

The systematic determination of the species here related is based mainly in the Brazilian contributions of Simone (2006) and Thomé *et al* (2006, 2007). The totality of the related specimens deposited in three malacological collections: Zoobotanical Museum Augusto Rushi - MUZAR (Museu Zoobotânico Augusto Rushi), Passo Fundo University, Rio Grande do Sul State - RS (part); Museum of Natural Sciences of the Lutheran University of Brazil - MCNU (Universidade Luterana do Brasil), Canoas, Rio Grande do Sul State (part); and Department of Ecology and Zoology, Center of Biological Science, Santa Catarina's Federal University - ECZ/CCB/UFSC (Universidade Federal de Santa Catarina), Florianópolis (part).

Systematic Species List:

Class BIVALVIA

Order Unionoida

Family MYCETOPODIDAE

- *Anodontites elongatus* (Swainson, 1823)<sup>1</sup> Two specimens (shells) examined

Family HYRIIDAE

- *Rhipidodonta charruana* (d'Orbigny, 1835) Nine specimens (shells) examined

Class GASTROPODA

Subclass Pulmonata

Family BULIMULIDAE

- *Bulimulus tenuissimus* (d'Orbigny, 1935)<sup>1</sup> One specimen (shell) examined

- *Mesembrinus interpunctus* (Martens, 1887) (Fig. 1)<sup>1</sup> One specimen (shell) examined

Family MEGALOBULIMIDAE

- *Megalobulimus haemastomus* (Scopoli, 1786) Fifty seven specimens (shells) examined

- *Megalobulimus oblongus* (Müller, 1774) Six specimens (shells) examined
- Family ODONTOSTOMIDAE
- *Macrodontes thielei* Pilsbry, 1930 (Fig. 2)<sup>1,2</sup> One specimen (shell) examined
- Family STREPTAXIDAE
- *Streptaxis pfeifferi* (Pilsbry, 1930) (Fig. 2)<sup>1,2</sup> One specimen (shell) examined
- Family SYSTROPHIIDAE
- *Happia iheringi* (Clessin, 1888)<sup>1, 2, 3</sup> Eleven specimens (microshells) examined, found in empty shells of native megasnails *Megalobulimus* spp.

1. New species registration to this remote place of the State ...
2. First registration of this species for Santa Catarina's State - SC ...
3. Particularly, other microsnail species, *Pseudoguppya* (= *Habroconus*) *semenlini* (Moricand, 1846) (EUCONULIDAE), obtained in earth and debris contained inside shells of native giant snails *Megalobulimus* spp, it was referred previously for this region in AGUDO (2008: 11) – included for other Western State localities by SIMONE (2006: 238), THOMÉ *et al* (2007: 21) and AGUDO-PADRÓN (2009 a: 8, 2010). The discovery of “microsnails” mixed to the accumulated “dump” inside of great native empty MEGALOBULIMIDAE shells it was already observed in the technical literature (Morretes 1954: 332-333) ...

After 14 complete years of systematic research, today the Santa Catarina's State, SC, small geopolitical space portion belonging to the Southern Brazil (Agudo & Bleicker 2006, Agudo 2007 a, Agudo-Padrón & Bleicker 2009 b, Agudo-Padrón 2010) (Fig. 1.b.), presents a confirmed nominal total of 867 Mollusca representatives (Table 1, Fig. 2), conjugated product of our specific effort of field studies, bibliographical revisions, organization and cataloguing of data, developed starting from the year of 1996 (Agudo & Bleicker 2006: 8; Agudo-Padrón 2010: 32), seeking to contribute to the regional knowledge of this diversified invertebrate fauna, already considered in the extent as one of the more poorly studied and known of Brazil (Agudo 2002, 2004; Agudo-Padrón 2010).



Figure 1.b. The little geopolitical territory of Santa Catarina State (down), in the context of the Brazilian country and South American continent (up).

Based on available estimates in contributions of SIMONE (1999: 133, 2006: 3) and RIOS (2009 - with 1770 registered species), relative to the totality of continental and marine malacological species esteemed for the vast Brazilian territory, to December 2009 the State is detainer of 63 limnic/freshwater ways (approached 16%)\*, 118 terrestrial specific forms (approached 15%)\*\*, and 675 marine representatives (approached 36%) up to now known (Table 1, Fig. 2).

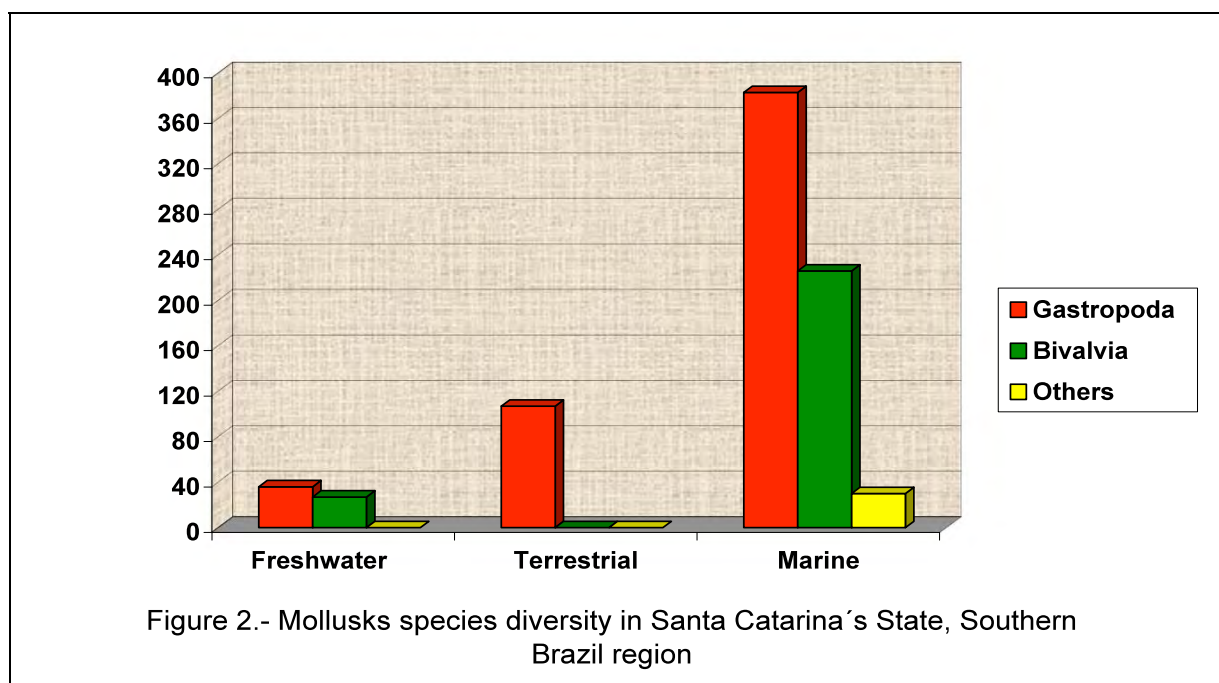
\* Today with 74 confirmed species (Agudo-Padrón 2010: 32) ...

\*\* Today with 119 confirmed forms ...

Table 1. Total number of well-known mollusks species in the Santa Catarina's State, Southern Brazil region, esteemed until the month of December of 2009.

	Terrestrial/ Amphibian	Limnic/ Freshwater	Marine/ Estuarine
Polyplacophora	-	-	10
Gastropoda	118	36	412
Scaphopoda	-	-	10
Bivalvia	-	27	230
Cephalopoda	-	-	13
<b>Total:</b>	<b>118</b>	<b>63</b>	<b>675</b>

Of these, 13 of the considered freshwater and terrestrial representatives they are included in several types of endangered conservation status (Agudo-Padrón 2009 c), and 18 of the general species constitute exotic forms - spontaneous invading and/or intentionally introduced for cultivation and human consumption ends (Agudo & Bleicker 2006, Agudo-Padrón & Lenhard 2010).



For its time, for the specific insular territory of "Santa Catarina's Island", belonging to the metropolitan and capital region of Florianópolis (Fig. 3), we have been confirming a total of 43 continental ways - 13 freshwater & 30 terrestrial (Agudo-Padrón 2009 a: 18), as well as 211 marine representatives (it calculates very close of its geographical southern neighbor "Baixada do Maciambú" region --- see Agudo-Padrón & Bleicker 2009 a: 11), highlighting continental species thankfully threatened (Agudo 2007 b; Agudo-Padrón 2010: 34, 36) and curious amphibian forms (Agudo-Padrón 2009).





Figure 3. Panoramic view of the Santa Catarina Island (right), the Santa Catarina's largest insular portion and political capital of the State (left)

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# Freshwater Mollusk Conservation Society

*... dedicated to the advocacy and conservation science of freshwater molluscan resources*

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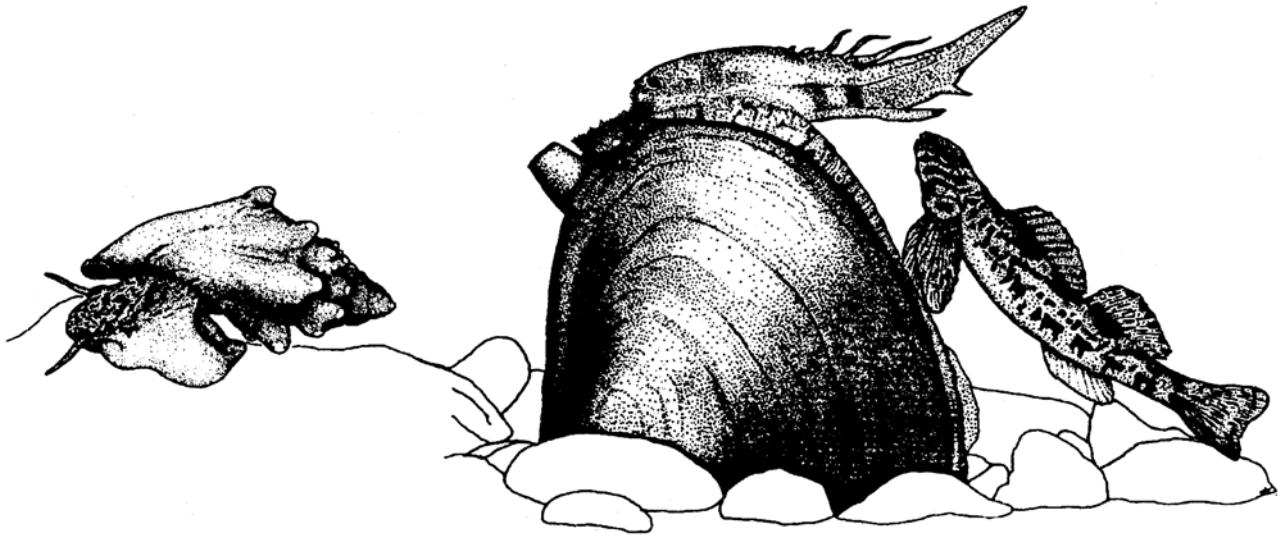
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