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Submissions for the December 2009 issue of Ellipsaria may be sent to the editor at any time but are requested by November 13, 2009. 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 Note that submissions are not peer reviewed, but are checked for content and general editing.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.
Announcements & News

FMCS 2010 Workshop – Regional Faunal Identification and Sampling

The 2010 workshop of the Freshwater Mollusk Conservation Society will be held in either late October or early November of 2010 in Kirkwood, Missouri. The workshop will be held at Missouri Department of Conservation’s Powder Valley Conservation Nature Center, located in a 112 acre oak-hickory forest just southwest of St. Louis, Missouri. In addition to two floors of exhibits, a large aquarium, and 3 hiking trails, the center has 3 classrooms and a 250 seat auditorium that will easily meet our needs. There are numerous nearby lodging, dining, and entertainment options.

The 2010 workshop will focus on regional faunal identification and sampling. A panel of regional faunal experts 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. In addition to presentations, there will be ample time to view representative species from the regions, and spend time discussing characters with the experts. To date we have secured commitments from experts representing the Ozarks, Atlantic Slope, upper Ohio, and Gulf Coastal faunal regions.

Following the workshop, field trips to the nearby Meramec River and the U.S. Geological Survey’s Columbia Environmental Research Center are planned. We hope to see you in fall 2010!

For more information please contact Steve McMurray (Stephen.McMurray@mdc.mo.gov; 573.882.9909) or Heidi Dunn (hdunn@ecologicalspecialists.com; 636.281.0973)

Publications


Models and model selection uncertainty in estimating growth rates of endangered freshwater mussel populations

Yan Jiao, Richard Neves, and Jess Jones

Canadian Journal of Fisheries and Aquatic Sciences 65(11):2389-2398. November 2008

Abstract: Appropriate inference of population status for endangered species is extremely important. Using a single model for estimating population growth rates is typically inadequate for assessing endangered species because inferences based on only one “best” model ignore model uncertainty. In this study, the endangered dromedary pearly mussel (Dromus dromas) in the Clinch and Powell rivers of eastern Tennessee, USA, was used as an example to demonstrate the importance of multiple models, with consideration of environmental noises for evaluating population growth. Our results showed that more than one model deserves consideration in making inferences of population growth rate. A Bayesian model averaging approach was used to make inferences by weighting each model using the deviance information criterion. To test the uncertainty resulting from model selection and the efficiency
of the Bayesian averaging approach, a simulation study was conducted on the dromedary pearlymussel populations, which showed that model selection uncertainty is very high. The results of these tests lead us to recommend using Bayesian model averaging to assess population growth status for endangered species, by balancing goodness-of-fit and selection uncertainty among alternate models.

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Contributed Articles

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

George Chadwick’s 1902 Survey of an Urban Freshwater Gastropod Fauna

Joan P. Jass
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800 West Wells Street
Milwaukee Wisconsin 53233; jass@mpm.edu

In the summer of 1902, Prof. George H. Chadwick of New York was invited by the Wisconsin Natural History Society to initiate a survey of the state's mollusk species. Assisted by members of the Society, Chadwick (1905, 1906) documented 115 bivalve and gastropod species collected at 93 stations in the southeastern region of the state, centered on Milwaukee. Voucher specimens were deposited in the Mollusk Collection of the Milwaukee Public Museum and have been subsequently entered into an electronic database.

At the time of this survey, Milwaukee was already a large urban settlement, having reached a population well over 300,000 by the early 1900s. The city had been founded in the early 1800s through the pioneering efforts of Solomon Juneau and Byron Kilbourn, who were attracted to its prime location on the western shore of Lake Michigan at a spot drained by the Kinnickinnic River, the Menomonee River including its marshes and tributary Honey Creek, the Milwaukee River including its tributary Mud Creek, Oak Creek, and the Root River.

Freshwater gastropods from these riverways were represented by 66 collecting records in the results from the Chadwick (1906) survey. Listing these records by family, in order of frequency of occurrence from greatest to least, gives the following sequence: Lymnaeidae (17), Planorbidae (12), Physidae (11), Viviparidae (9), Hydrobiidae (7), Pleuroceridae (5), Valvatidae (4), Ancylidae (1). The gastropod records from these 8 families represent 25 currently recognized species.

Now another century later, the Milwaukee area has become even more urbanized, and the current population of the city is double what it was a hundred years ago. A comparison between Milwaukee River mollusks as documented by 1991 collecting and by 1902-1910 survey work showed biodiversity significantly reduced, with only 8 gastropod species found in comparison to the 20 recorded earlier (Jass & Glenn 2002). Pollutants that include industrial contaminants present an environmental hazard to the fauna of these urban riverways, with the Kinnickinnic being named as one of the country's most endangered rivers in 2007 (Wodder 2007). However, federal, state, and city funds have recently been allocated for a cleanup begun in 2009 (Bergquist 2009), and it is hoped that surveys of the future may document renewed aquatic habitats with their molluscan inhabitants still thriving in this urban setting.

Literature Cited

A Second Compilation of Predators of Freshwater Molluscs in Israel and Palestine

Henk K. Mienis
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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 second attempt to summarize the published and unpublished information dealing with predation on freshwater molluscs in Israel and Palestine. Only records of prey species identified at least at the generic

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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 second attempt to summarize the published and unpublished information dealing with predation on freshwater molluscs in Israel and Palestine. Only records of prey species identified at least at the generic
level have been included in the list. I hope sincerely that this list will lead to a stream of additional records.

In the near future a similar list will be published dealing with the parasites so far recorded from freshwater molluscs in the same region. These parasites exploit the molluscs often as an intermediate host in order to reach their final host: often a predator of the aquatic molluscs.

**Predators of freshwater molluscs in Israel and Palestine**

Family NERITIDAE
*Theodoxus (Neritaea) jordani jordani* (Sowerby, 1836)
Starling – *Sturnus vulgaris* (Mienis, 2004).

*Theodoxus (Neritaea) karasina* (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);

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

Family COCHLIOPIDAE
*Helobdella (Semisalsa) contempta* (Dautzenberg, 1894)

Family BITHYNIIDAE
*Bithynia phialensis* (Conrad, 1852)
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 triseriata* (as *H. punctatolineata*) (Mienis, 1986a);
Levant freshwater crab – *Potamon potamios* (Mienis, 2004);
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)

*Thiara scabra* (Müller, 1774)

Family MELANOPSIIDAE
*Melanopsis buccinoidea* (Olivier, 1801)
Levant freshwater crab – *Potamon potamios* (Mienis, 2003);
Fire (or Spotted) Salamander – *Salamandra salamandra* (Degani & Mendelsohn, 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 triseriata* (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*).

*Stenophyso marmorata* (Guilding, 1828)

Family PLANORBIDAE
*Bulinus (Isidora) truncatus* (Aoudouin, 1826)
Green Sandpiper – *Tringa ochropus* (Mienis, 1986b).

*Gyraulus* (*Gyraulus piscinum*) (Bourguignat, 1852)
Rainbow trout – *Oncorhynchus mykiss* (Mienis, 2004).

*Planorbella duryi* (Wetherby, 1879)

Leech – *Helobdella triserialis* (as *H. punctatolineata*) (Mienis, 1986a); Green sandpiper – *Tringa ochropus* (Cockburn, 1946).

Family **LYMNAEIDAE**

*Pseudosuccinea columella* (Say, 1817)

Leech – *Helobdella triserialis* (as *H. punctatolineata*) (Mienis, 1986a);

Moorehen – *Gallinula chloropus* (Mienis, 1987);


Family unknown

Stylommatophoran snails (either *Haitia, Bulinus* and/or *Gyraulus*)

Caspian terrapin – *Mauremys caspica rivulata* (Sidis & Gasith, 1985).

Gastropods

Rainbow trout – *Salmo gairdneri* (Degani et al., 1987)


Family **UNIONIDAE**

*Unio mancus eucirrus* Bourguignat, 1857


*Unio terminalis delicatus* Lea, 1863

Kingfishers – either *Haliccon smyrnensis* or *Ceryle rudis* (Mienis, 2004).

*Unio terminalis terminalis* Bourguignat, 1852

Moorehen – *Gallinula chloropus* (Mienis, 2004);


Family **CORBICULIDAE**

*Corbicula consobrina* (Cailliaud, 1823)


*Corbicula fluminalis* (Müller, 1774)


Catfish – *Clarias gariepinus* (Yaron Krotman, unpublished)

* So far only one species of freshwater crab 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 Dr. Sh. Ashkenazi (Hebrew University of Jerusalem) and Mr. Shalom Hayat for donating large quantities of freshwater mussels most probably predated upon by a species of Kingfisher to the National Mollusc Collection of the Hebrew University of Jerusalem. Likewise I like to thank the students of Prof. Menachem Goren (Tel Aviv University) for showing me regularly the molluscs found in the intestines of freshwater fishes.

References


Mienis, H.K., 2003. Molluscs from the excavation of Tel Kabri (with an appendix dealing with Crustaceans found at that site). Triton, 7: 28-37.


First Records of the Joint Occurrence of two Tropical Invasive Freshwater Gastropods at Localities in Israel

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The highly invasive freshwater snails: the Quilted melania Tarebia granifera (Lamarck, 1822) and the Pagoda tiara Thiara scabra (Müller, 1774), Fam. Thiariidae, have been reported recently from various localities in Israel (Ben-Ami, 2006; Mienis, 2008; Mienis & Mienis, 2008a-b). Although most of the known localities of both species are situated in the Bet Shean Valley, so far these two species have never been encountered together in Israel.

On 21 July 2009 the junior authors carried out ichthyological field work in the Tel Saharon Nature Reserve, Lower Bet Shean Valley. They used the opportunity to take at random a more or less equally sized mollusc sample at two localities in the reserve. These samples were submitted to the senior author for identification. The results are presented in Table 1. If no remarks are given then all the material consisted of adult, living specimens.

Table 1. Freshwater snails collected near Tel Saharon and 'En Saharon.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Theodoxus michonii</td>
<td>37</td>
<td>11</td>
</tr>
<tr>
<td>Heleobia species</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Melanoides tuberculata</td>
<td>20</td>
<td>565</td>
</tr>
<tr>
<td>Tarebia granifera</td>
<td>35</td>
<td>19</td>
</tr>
<tr>
<td>Thiara scabra</td>
<td>217</td>
<td>31*</td>
</tr>
<tr>
<td>Melanopsis buccinoidea</td>
<td>2**</td>
<td>1**</td>
</tr>
<tr>
<td>Melanopsis cerithiopsis</td>
<td>1252</td>
<td>227</td>
</tr>
<tr>
<td>Haitia acuta</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>1563</td>
<td>864</td>
</tr>
</tbody>
</table>

* One adult and 30 juveniles.
** Fresh dead.

Ben-Ami (2006) had reported already Tarebia granifera from 'En Saharon, however, to our surprise not only fair numbers of the Quilted melania but also Thiara scabra were present in both samples together with a native Thiariid species: the Red-rim melania Melanoides tuberculata (Müller, 1774). Yet the numbers in which they appeared in the samples varied significantly between the two localities.

In 'En Saharon more species were encountered than in Tel Saharon. Altogether eight different species were recognized of which three have to be considered invasive species: Tarebia granifera, Thiara scabra and Haitia acuta (Draparnaud, 1805) [syn. H. heterostropha (Say, 1817)].

Interestingly only few empty, but fresh looking shells were found of Melanopsis buccinoidea (Olivier, 1801), the most widely distributed Melanopsis species in Israel. At the other hand Melanopsis cerithiopsis Bourguignat, 1884, restricted in its distribution in Israel to the Bet Shean Valley and springs and streams in the Lower Jordan Valley, but not in the Jordan River, was extremely common at Tel Saharon (1252 specimens!).

Future work has to show whether the presence of the invasive species has any deteriorating influence on the populations of the local species.

References

Additional Information Concerning the Conquest of Europe by the Invasive Chinese Pond Mussel Sinanodonta woodiana. 20.
News from Belgium.

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On 20th January 2009 Carine Richerzhagen posted a photograph of a large freshwater mussel on the website http://waarnemingen.be/ , a popular site for reporting interesting observations dealing with the fauna and flora of Belgium. She had found that mussel in a pool in the nature reserve and protected landscape "De Maten" near Genk, Belgium. The photograph was supposed to represent Anodonta cygnea (Linnaeus, 1758). However, the size of the specimen (length over 20 cm), the general form of the shell and the bulbous umbonal area showed that we were dealing
with a perfect specimen of the invasive species *Sinanodonta woodiana* (Lea, 1834).

The recognition of that fact has led to the publication of two short notes and a poster dealing with finds of the Chinese Pond mussel in Belgium (Richerzhagen & Van den Neucker, 2009; Packet et al., 2009a-b).

According to the new observations and previously published data (Sablon, 2002; Keppens & Mienis, 2003 & 2004) this invasive mussel is now known in Belgium from at least four different localities in Flanders: Diest (1999), Zonhoven (2001), Oud-Heverlee (2001) and De Maten near Genk (2009). In Diest these mussels were found in a recreational pool, at all other localities in former fish farms. This mussel species may turn up easily at additional localities in Flanders because all the pools are connected in one way or another with streams.

References

** New Malacological Records from Paraná State, PR, Southern Brazil Region. II. Supplementary Annex**

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Continuing the search results of which were submitted in previous edition of this issue (Agudo-Padrón 2009 a), here a new regional contributions generated in the course, with some additional malacological registrations for the State in general (Amaral et al 2008; Coscarelli et al 2008; Machado et al 2008: 479**; Agudo-Padrón 2009 b; Arruda et al 2009; IBGE 2009**; Martim et al 2009; Meyer et al 2009 a), the “Iguazu River Basin” (Belz et al 2008; Clavijo et al 2008; Netto et al 2008), the “Vila Velha” Ecological State Park (Meyer et al 2009 b) – whose geographical and environmental characteristics are conveniently described by Melo (2006) – and the “Iguazu Waterfalls National Ecological Park” regions (Gregoric & Rumi 2008; Gregoric et al 2008; Rumi et al 2008), this last one at least five aquatic/limnic snail species and 1 naiad mussel/clam, systematically included in 2 class, 5 families and genera, elevating for 139 the previous confirmed number of continental species and subspecies (Agudo-Padrón 2009)


Systematic Species List :
Class GASTROPODA
Subclass CAENOGASTROPODA / PROSOBRANCHIA
  Family HYROBIIDAE
    - *Potamolithus* spp (two forms) (*)
Subclass PULMONATA
  Family SUCCINEIDAE
    - *Succinea* sp (*)
  Family ANCYLIDAE
    - *Uncancylus concentricus* (d’Orbigny, 1835) (*)
  Family CHILINIDAE
    - *Chilina iguazuensis* Gregoric & Rumi, 2008 (*)

Class BIVALVIA
Order UNIONOIDEA
  Family HYRIDIIDAE
    - *Castalia undosa* Martens, 1827 (*)

References:


Simone, L.R.L. 2006. Land and freshwater molluscs of Brazil. São Paulo, SP: FAPESP.

Endangered Continental Mollusks of Santa Catarina State, Southern Brazil: An Overview

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Until the present, the inventory of freshwater and terrestrial mollusks of Santa Catarina's State, SC, the small geographical portion of the Southern Brazil region (Agudo 2007:11), behaves checklist of 162 continental species and confirmed subspecies (For a general historical revision and specific known, see Agudo (2007) and Agudo-Padrón (2008 a-b, 2009 a-c), including 24 freshwater mussels/clams (two exotic, 22 natives) and 138 gastropods (32 freshwater/limnic – one exotic species & 106 terrestrial – 10 exotic forms).

Even so, today its sensitive bio-ecological ignorance in this territory is mixed to the fact of the urgent need of its effective conservation. According to Mansur et al (2003) and Mansur (2008), it just is not enough to place the native species in lists of those threatened of extinction: it is necessary to know our native fauna from the taxonomic, morphologic and ecological point of view for then to propose handling strategies. Only to have an idea of this situation, in the just two year-old period - between 2007 and 2009 (Agudo 2007; Agudo-Padrón 2008 b, 2009 c) - they were increased to the inventory of species more 31 terrestrial gastropods.

Now for Santa Catarina - SC, a total of 13 (8.0%) of its continental species like this registered, included in 7 Genera and 4 Families - three Pulmonate terrestrial gastropods (two Megalobulimidae and one micro-snaill Charopidae ) and 10 Unionoid naids (seven Mycetopodidae and three Hyriidae)*, they are considered in world categories established by the International Union for Conservation of the Nature - UICN: seven as "Vulnerable" – Anodontites tenecricosus (Lea, 1834), Anodontites trapesialis (Lamarck, 1819), Mycetopoda legumen (Martens, 1888), Mycetopoda siliquisos (Spix, 1827), Diplodon expansus (Küster, 1856), Diplodon multistriatus (Lea, 1834), Rhipidodonta charruana (d’Orbigny, 1835); and six "In Danger" – Megalobolus grandis (Martens, 1885), Megalobolus prolicl (Martens, 1888), Rotadiscus schuppi (Suter, 1900), Anodontites ferrarisi (d’Orbigny, 1835), Anodontites porosus (Lamarck, 1819), Leila blainvillleana (Lea, 1835) (Mansur et al 2003; MMA 2004; Scarabino 2004; Amaral, et al 2008; Machado et al 2008).

* Appraised these last ones under the systematic optical of Simone (2006: 249-305, 312); the remaining species (Gastropoda) through
Concerning the micro-snail species *Rotadiscus schuppi* (Suter, 1900) (CHAROPIDAE), MANSUR *et al* (2003: 69-70) they still consider with vindicative that dictates species it presents "Insufficient Data.

Other species, such as *Rectartemon depressus* (Heynemann, 1868) (Pulmonate terrestrial micro-snail STREPTAXIDAE), *Anodontites elongatus* (Swainson, 1823) and *Diplodon rhacioicus* (Unionoid naiads MYCETOPODIDAE and HYRIDAE, respectively), they are recently incorporate through the “Livre Vermelho da Fauna Brasileira Ameaçada de Extinção” – Red Book of the Threatened of Extinction Brazilian Fauna (Amaral, et al 2008: 195-196, 208-210; Machado, et al 2008: 476), even so without category established UICN.

Important graphic source, specific concerning the involved brazilian freshwater and terrestrial forms, it is the "thematic maps" produced by IBGE (2008, 2009).

Finally, most of the mussel naiads UNIONOIDA referred though they appear included in the relationship of the "Plano Nacional de Recuperação e de Gestão para Espécies de Peixes e Invertebrados Aquáticos" – National Plan of Recovery and of Administration for Species of Pisces and Spineless Aquatic (MMA 2006).

References:


II. New Bibliographical Records.

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Continuing the search results of which were submitted in previous edition (Ellipsaria 11(1):13-18), here are new regional contributions which escaped our initial attention or have recently been produced:

I. GENERAL FORMS

http://www.caminhosdegeografia.ig.ufu.br/viewarticle.php?id=664&layout=abstract

II. MARINE / ESTUARINE FORMS


III. CONTINENTAL FRESHWATER / LIMNIC FORMS


IV. CONTINENTAL TERRESTRIAL FORMS

For more than 100 years, biologists studying freshwater mussels have recognized that the approximately 300 North American species typically occur in a few, geographically-distinct faunal zones. Some of these mussel faunal zones coincide with present continental or regional stream drainage basins but others clearly do not. Early on, Ortmann concluded that at least some mussel faunal groups represent pre-glacial associations and separations of the river systems in which the various species arose (Ortmann 1913:382). Within each faunal zone, species number is typically associated with stream size: the most species occur in the largest river segments, traeling off to just a few species in the smallest creeks. Three large, old rivers, however, -- each in a different faunal zone -- do not follow this stream size-species number relationship. Kanawha Falls on the New River, Cumberland Falls on the upper Cumberland River, and Tallassee Falls on the Tallapoosa River, apparently, have each prevented most mussel species from gaining access to the upstream part of these watersheds. These falls may have been barriers to upstream mussel colonization since at least Mesozoic time.

I gathered mussel occurrence records from each of these three isolated watershed segments from published papers, state mussel survey reports, and shells deposited in the Ohio State University and Auburn University mussel collections. For the New and upper Cumberland river watersheds, these sources include survey reports conducted nearly 100 years ago (Ortmann 1913, and Wilson and Clark 1914, respectively). I could not find any early survey data from the upper Tallapoosa watershed, even though his correspondence indicates that H. H. Smith did some collecting in the upper Tallapoosa basin during the 1910s and early 1920s.

When combined, the published and museum records indicate that between 11 and 16 mussel species have been reported from above the falls in each of these three basins (see table). Distribution data, however, show that only a few of the species are now or, previously, were widely distributed in each area, suggesting they might have been present in the basins for a very long time. Several species are known in these watersheds only from isolated populations or from a very few specimens. Other species may be represented by large extant populations; however, they occur only in limited parts of the watersheds, often associated with
impoundments or other human modifications of the streams. Even among the species that are now widespread in these watershed areas – five species in each case – early reports or collection data indicate that four of them (two in the New, and one each in the upper Cumberland and upper Tallapoosa – see table footnote) were not widely distributed in the watersheds in the past.

The resulting list of likely long-term residents in these three isolated watersheds (three or four species, each) includes some interesting similarities. All three watersheds support populations of *Elliptio* species that have been identified as, or look quite similar to, *Elliptio dilatata*. In addition, both the New and upper Cumberland rivers support populations of *Alasmidonta* species (*A. marginata* in the New and *A. atropurpurea* and *A. viridis* in the upper Cumberland). Given these results, it does not seem unreasonable to suggest that at least some of the populations now found above these three sets of falls represent extremely old and, perhaps, truly ancient roots of the North American mussel fauna. It would be interesting to see if this suggestion is supported or discounted by genetic comparisons of these mussel populations living above the falls.

**Literature Cited:**

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**Mussel Species Reported from Above the Falls in the New, Upper Cumberland, and Upper Tallapoosa River Watersheds**

<table>
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<tr>
<th>Categories</th>
<th>New River (WV, VA &amp; NC)</th>
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<th>upper Tallapoosa (AL &amp; GA)</th>
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<tr>
<td>Isolated Populations or Dubious Records</td>
<td>Lasigmonga etowahensis</td>
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<td></td>
<td>Lasigmonga holstonia</td>
<td>Toxolasma parvum</td>
<td>Fusconaia ebena</td>
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<td>Quadrula quadrula</td>
<td>Villosa lienosa</td>
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<td>Toxolasma parvum</td>
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<td>Utterbackia imbecillis</td>
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<td>Quadrula rumphiana</td>
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<td>Villosa irus</td>
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<td>Limited Distributions</td>
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<td>Hamiota altillis</td>
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<td>Lampsilis fasciola</td>
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<tr>
<td>Widespread Above the Falls</td>
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<td>Cyclonaias tuberculata*</td>
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<td>Total Reported Above the Falls</td>
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<td>Reported Just Downstream from the Falls</td>
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</table>

* Probably not widespread in this part of the basin 100 years ago
FMCS 2008 Freshwater Mollusk Bibliography

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

This bibliography lists freshwater mollusk papers that have been published up to and including 2008 and that have not appeared in previous FMCS bibliographies.

Citations are split into five groups: Unionoida, Sphaeriidae, Corbiculidae, Dreissenidae & Other Bivalves, and Gastropoda. Papers that list taxa from more than one category are included in each group. A searchable database of over 18,000 references on freshwater mollusks is available at: http://ellipse.inhs.uiuc.edu:591/mollusk/

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

UNIONOIDA (FRESHWATER MUSSELS)


Gagne, F., C. Andre, P. Cezka, R. Hausler, M. Fournier, and C. Blaise. 2008. Immunotoxic effects on freshwater...


CORBICULIDAE (ASIAN CLAMS)


DREISSENIDAE & OTHER BIVALVES (MYTILIDAE, ETC.)


mechanism underlying intraspecific competition. Freshwater Biology 53(12):2356-2363.


GASTROPODA


Brown, K.M., B. Lang, and K.E. Perez. 2008. The conservation ecology of North American pleurocerid and


Ferrite, V. 1994. Le macroinvertébrés benthique de la riviere Simeto (Sicile) et de quelques-uns de ses


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