



Newsletter of the Freshwater Mollusk Conservation Society
Volume 21 – Number 3 **September 2019**

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**Help Design the 2020 FMCS
Surveying Workshop**

Ryan Schwegman and Lisie Kitchel

Next summer, the FMCS Guidelines and Techniques Committee will present a Workshop on mussel and, possibly, snail survey techniques. We already know this Workshop will be held August 10-13, 2020, at Henry Horton State Park on the banks of the Duck River, about one hour south of Nashville, Tennessee. What we have not yet determined is the specific content this Workshop should include to be of the most value for those who will attend.



Table Restaurant. More information about the Park is available at <https://tnstateparks.com/parks/henry-horton>.

We intend for this Workshop to provide background and insight on survey methods, state and federal survey guidelines, and data analysis techniques that will include learning opportunities for both those just beginning to sample freshwater mollusks and our most seasoned members. The streamside location of this Workshop will allow participants to gain both classroom and wet opportunities to explore the benefits and the challenges of the techniques that will be discussed. The Workshop will be



accompanied by a poster session and mixers to encourage discussion among participants, and an optional field trip to a destination yet to be determined.

In the near future, we will be soliciting input from the membership on what to cover during this Workshop. Your input on specific content about mussel and snail survey techniques, state and federal requirements, and analysis tools will be used to guide the key speakers, classroom presentations, and field sessions that will be offered. If you already know of things you want to have discussed at Henry Horton next summer, please let us know. You can contact Ryan at rschwegman@enviroscienceinc.com and Lisie at Lisie.Kitchel@wisconsin.gov. We would also like to hear from you if you want to assist in planning or presenting this Workshop.



Our intention is for this Workshop to be both interesting and truly relevant to the surveying needs of FMCS members. We look forward to your input on its content and your participation next Summer.

Announcement

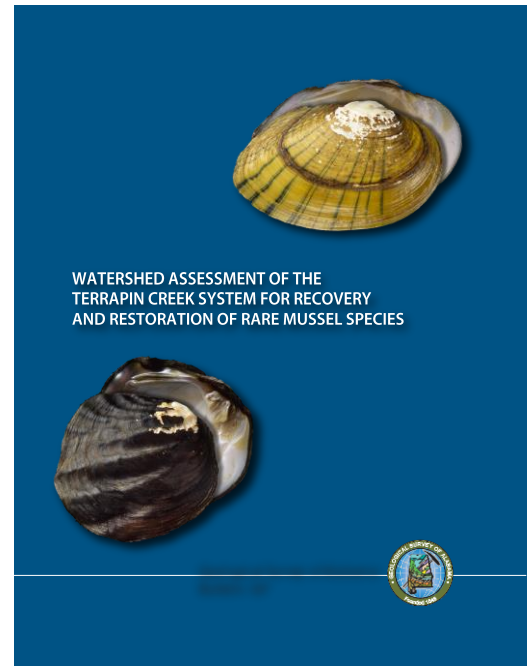
Geological Survey of Alabama Bulletin 187

Watershed Assessment of the Terrapin Creek System for Recovery and Restoration of Rare Mussel Species

By: Rebecca A. Bearden, Patrick E. O'Neil, Stuart W. McGregor, E. Anne Wynn, Gregory H. Pierce, and David G. Herder

Available from: Publications Office, Geological Survey of Alabama, P. O. Box 869999, Tuscaloosa, Alabama 35486-6999. 205-247-3636 publications@gsa.state.al.us
<https://www.gsa.state.al.us/ogb/publications>

Price: \$10.00 + \$4.50 shipping
(online credit card orders have a 4% surcharge)



Abstract

Terrapin Creek, a Coosa River tributary in northeastern Alabama near the Georgia state line, has been designated a strategic habitat unit for the restoration and recovery of imperiled aquatic species in Alabama for the following reasons:

- the historic occurrence of three mussel species that are federally endangered or threatened: the Upland Combshell (*Epioblasma metastrata*), the Georgia Pigtoe (*Pleurobema hanleyianum*), and the Southern Pigtoe (*Pleurobema georgianum*).
- the historic occurrence of four mussel species considered of high conservation concern in Alabama: the Etowah Heelsplitter (*Lasmigona etowaensis*), the Black Sand Shell (*Ligumia recta*), the Southern Purple Lilliput (*Toxolasma corvunculus*), and the Coosa Creekshell (*Villosa umbrans*).
- the presence of two mussel species listed as federally endangered or threatened: the Finelined Pocketbook (*Hamiota altilis*) and the Southern Clubshell (*Pleurobema decisum*).
- the presence of four mussel species considered of high conservation concern in Alabama: the Alabama Spike (*Elliptio arca*), the Delicate Spike (*Elliptio arctata*), the Alabama Creekmussel (*Pseudodontoideus connasaugaensis*), and the Alabama Rainbow (*Villosa nebulosa*).

Data on biology, habitat, and water quality conditions are presented in this report. Recent mussel surveys confirm the presence, in good abundance, of some listed species, while other species were found only in marginal numbers. Biological condition in the watershed is generally good in the forested areas, particularly in Marys Creek and South Fork Terrapin Creek, but poor to fair conditions were noted in the lower main channel of Terrapin Creek. Habitat surveys identified several sites in poor to marginal condition, while many other sites were rated suboptimal to optimal.

Terrapin Creek downstream of Nances Creek, Terrapin Creek upstream of Nances Creek to its headwaters, and Hurricane Creek, are a priority subwatersheds for implementing habitat restoration projects and conducting future monitoring. Development of a watershed management plan for the recovery of populations of imperiled species is recommended. A Terrapin Creek action plan is presented in this report as a framework for the prioritization of habitat restoration and species recovery efforts. Recommendations for improving aquatic habitat, water quality, water flows, and overall water resource quality are described in the action plan.

Upcoming Meetings

September 29 – October 3, 2019 – Joint Meeting of the American Fisheries Society and the Wildlife Society, Reno-Sparks Convention Center, Reno, Nevada, USA <http://afstws2019.org/>

October 27 – 30, 2019 – Southeastern Association of Fish and Wildlife Agencies 73rd Annual Conference, Hilton Head Marriott Resort, Hilton Head, South Carolina., USA.
<http://www.seafwa.org/conference/overview/>

March 29 – April 2, 2020 – National Shellfisheries Association 112th Annual Meeting, Radisson Hotel Baltimore Downtown-Inner Harbor, Baltimore, Maryland USA. <https://www.shellfish.org/annual-meeting>

June 7 – 12, 2020 – Society for Freshwater Science and Association for the Sciences of Limnology and Oceanography Joint Meeting, Madison, Wisconsin, USA. Theme: *Sustaining Aquatic Ecosystems Under Global Change* <http://sfsannualmeeting.org/>

Summer ? 2020 – American Malacological Society Annual Meeting “Florida Keys” [Specific Dates, Location, and Theme not yet posted] <https://ams.wildapricot.org/Meetings>

July 26 – 31, 2020 – Society for Conservation Biology North American Sectional Meeting, Denver, Colorado. Theme: *Crossing Boundaries: Innovative Approaches to Conservation*
<http://conbio.org/groups/sections/north-america/meetings/>

August 10 – 13, 2020 – FMCS Survey Guidelines and Techniques Workshop, Henry Horton State Park, Tennessee, USA [Specific content and other details now being developed]

Spring ? 2021 – FMCS 12th Biennial Symposium, Portland, Oregon, USA [Dates, Location, and Theme not yet determined]

Spring ? 2023 – FMCS 13th Biennial Symposium, Michigan (?) [Dates, Location, and Theme not yet determined]



Contributed Articles

The following articles have been contributed by FMCS members and others interested in freshwater mollusks. These contributions are incorporated into *Ellipsaria* without peer review and with minimal editing. The opinions expressed are those of the authors.

Grasse River Mussel Relocation Project

Mary McCann, HDR, Inc., Mary.McCann@hdrinc.com

The Grasse River, a tributary to the St. Lawrence River in northern New York, is currently undergoing a U.S. Environmental Protection Agency Superfund-led cleanup effort to remove or otherwise isolate polychlorinated biphenyls (PCBs) from the environment. Prior to the remedial activities, which include dredging of nearshore areas and capping of sediments in the main channel, the New York State Department of Environmental Conservation (NYSDEC) has been working in cooperation with the New York State Museum and the Saint Regis Mohawk Tribe to relocate a portion of the freshwater mussel stocks in the river out of the areas expected to be disturbed by the remediation. Surveys have shown that the Grasse River has a dense and robust mussel community, with 11 different mussel species identified in the lower river prior to the restoration efforts, four of which are listed as Species of Greatest Conservation Need (SGCN) in New York. Because the remedial project extends along a 7.2 mile stretch of the river, NYSDEC estimates that up to 1.4 million mussels could be impacted during the dredging and capping.

This unique and innovative mussel recovery effort is a planned 5-year effort. The initial phase, in 2017 and 2018, focused on collecting mussels from shallow water areas affected by the remedy and holding a portion of them in cages to be relocated to affected areas after the remediation is complete. In 2019, the project added greater collection of mussels from shallow water areas and relocating them to nearby parts of the river that are not targeted for dredging to assist in recovery of populations after the project is over.

Under a long-term engineering standby contract HDR Incorporated was selected by the NYSDEC to conduct the mussel collection and relocation activities in 2019. So far this year -- from early June to late-August -- four HDR biologists, teamed with four Fathom Resources divers, have collected, sorted, identified, cleaned off zebra mussels, and relocated more than 173,000 freshwater mussels (Table 1). The three most abundant species account for 97.5 % of the total, with 77.5% *Elliptio complanata*, 14.2% *Lampsilis radiata*, and 5.8% *Potamilus alatus*. In addition to the 11 species previously identified from this reach of the river, three additional species have been found (the last three species listed in Table 1), two of which are SGCN species.

The field work for this project continues into the fall of 2019 and will resume in spring 2020. This project is supported by the New York State Environmental Protection Fund and Return a Gift to Wildlife, a state program funded by voluntary donations New York residents can make when filing their tax returns.



Table 1. Mussel species found in the reach of the Grasse River involved in the PCB remediation project. The species are arranged in abundance order.

<i>Elliptio complanata</i> (Eastern elliptio)
<i>Lampsilis radiata</i> (Eastern lampmussel)
<i>Potamilus alatus</i> (pink heelsplitter)*
<i>Leptodea fragilis</i> (Fragile papershell)
<i>Pyganodon</i> sp.
<i>Pyganodon grandis</i> (Giant floater)
<i>Pyganodon cataracta</i> (Eastern floater)
<i>Utterbackii imbecillis</i> (Paper pondshell) *
<i>Ligumia nasuta</i> (Eastern pondmussel) *
<i>Lampsilis cardium</i> (Plain pocketbook) *
<i>Lampsilis</i> sp. (<i>L. radiata</i> / <i>L. cardium</i>)
<i>Strophitus undulatus</i> (Creeper)
<i>Alasmidonta undulata</i> (Triangle floater)
<i>Lasmigona costata</i> (Fluted shell)
<i>Ligumia recta</i> (Black sandshell) *
<i>Alasmidonta marginata</i> (Elktoe) *

* SGCN species

First confirmed record of the native freshwater pea clam Sphaeriidae *Musculium argentinum* (d'Orbigny, 1835) in Santa Catarina State/ SC, Central Southern Brazil

A. Ignacio Agudo-Padrón and **Francisco Carneiro**, Project Avulsos Malacológicos - AM, P.O. Box 010, 88010-970 Centro, Florianópolis, Santa Catarina/ SC, Brazil
– ignacioagudo@gmail.com; fecbio@gmail.com; <http://noticias-malacologicas-am.webnode.pt/>

Until recently, the family Sphaeriidae, tiny native freshwater bivalves, has been represented in the geographic territory of Santa Catarina State/ SC by ten species in three of the four recognized genera (Ishikawa 2019). *Eupera* Bourguignat, 1854, is represented by three regionally accounted species of the nine known (Agudo-Padrón and Carneiro 2019 – this issue); *Pisidium* Pfeiffer, 1821, is represented by six regionally accounted species of the nine known; and *Sphaerium* (Scopoli, 1777), is represented by one general accounted species (Agudo-Padrón 2018: 57-Table 1).

On April 17 2019, the second author of this report forwarded some photographs of curious/ singular little limnic bivalves found during a biotic sampling campaign in a visibly anthropized muddy substrate environment with the aid of Surber Sampler for Benthos. These specimens came from a riverside sector of the Rio Miranda hydrographic microbasin (26°19'58.90S & 48°39'12.03W), a little stream located in the São Francisco do Sul Municipal District, Malacological Region Number 2, Northern of Santa Catarina State/ SC, Central Southern Brazil (Agudo-Padrón 2018a:58) (Figure 1).

The specimens in question were finally confirmed as the native limnic/ freshwater pea clam Sphaeriidae *Musculium argentinum* (d'Orbigny, 1835) (Figure 2). They has been deposited in the Malacological Collection of the Regional University Foundation of Blumenau – FURB, Blumenau/ SC ~ Voucher FURB MO 363 (Agudo-Padrón 2019: Figure 12).

This is the first confirmed geographical record of *Musculium argentinum* (d'Orbigny, 1835) in the geographical territory of Santa Catarina State/ SC. It raises to eleven the number of freshwater pea clam species of the family Sphaeriidae Deshayes, 1855 known from Santa Catarina State and, finally, adds the genus *Musculium* Link, 1807 to the general State inventory of continental/ non-marine mollusks.



Figure 1. Location (map – red color) of the São Francisco do Sul Municipal District in the North region of Santa Catarina State/ SC, and the collection area in Rio Miranda microbasin where the pea clams were found.

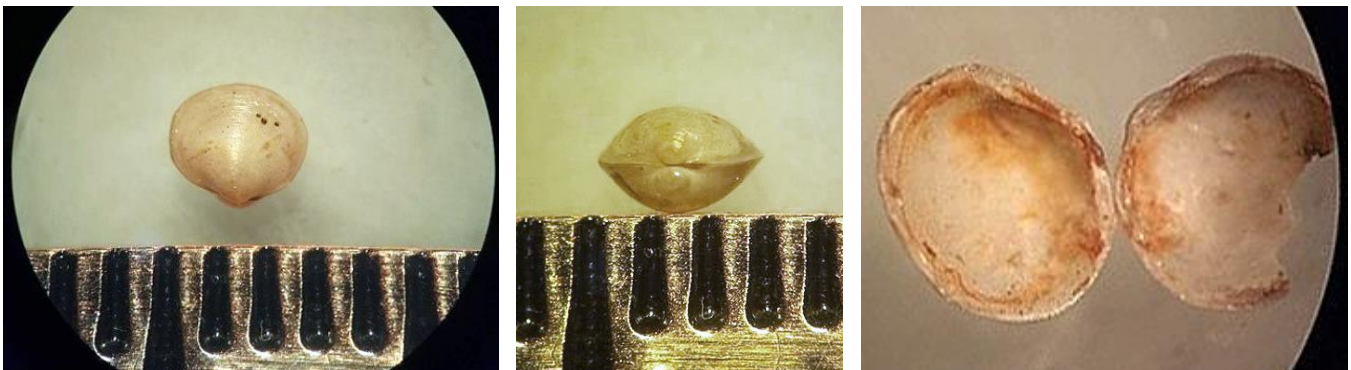


Figure 2. Different views of the native limnic/ freshwater pea clams Sphaeriidae *Musculium argentinum* (d'Orbigny, 1835) found in the Rio Miranda hydrographic microbasin.

References:

- Agudo-Padrón, A.I. 2018. Revised and updated systematic inventory of non-marine molluscs occurring in the State of Santa Catarina/SC, Central Southern Brazil region. *Advances in Environmental Studies*, 2(1):54-60. Available online at: <http://scholarlypages.org/Articles/environmental-studies/aes-2-007.pdf?jid=environmental-studies>
- Agudo-Padrón, A.I. 2019. Additions to the systematic inventory of non-marine molluscs occurring in the State of Santa Catarina/ SC, Central Southern Brazil region. *Advances in Environmental Studies*, ... submitted contribution, in editorial process.
- Agudo-Padrón, A.I. and Carneiro, F. 2019. First confirmed record of the native limnic/ freshwater pea clam Sphaeriidae *Eupera bahiensis* (Spix, 1827) in Santa Catarina State/ SC, Central Southern Brazil *Ellipsaria*, 21(3):8-9 (this issue).
- Ishikawa, W. 2019. Bivalves Esferídeos, “Micro-Berbigões”. *Planeta Invertebrados Brasil Website*. Available online at: http://www.planetainvertebrados.com.br/index.asp?pagina=especies_ver&id_categoria=27&id_subcategoria=0&com=1&id=266&local=2

**First confirmed record of the native limnic/ freshwater pea clam
Sphaeriidae *Eupera bahiensis* (Spix, 1827)
in Santa Catarina State/ SC, Central Southern Brazil**

A. Ignacio Agudo-Padrón and **Francisco Carneiro**, Project Avulsos Malacológicos - AM, P.O. Box 010, 88010-970 Centro, Florianópolis, Santa Catarina/ SC, Brazil
– ignacioagudo@gmail.com; fecbio@gmail.com; <http://noticias-malacologicas-am.webnode.pt/>

Until recently, the tiny pea clams of the genus *Eupera* Bourguignat, 1854 were represented in the geographic territory of Santa Catarina State/ SC by just two of the nine known species (Agudo-Padrón 2018:57 Table 1; Ishikawa 2019). In May and June 2019, the second author of this report forwarded some photographs of singular little limnic bivalves/ pea clams coming from two geographical localities and different environments.

1. May 01 2019: Riverside sector of the Rio Corticeirinha hydrographic microbasin (26°26'58.26"S & 48°53'25.25"W), located in the Guaramirim Municipal District, Malacological Region Number 2, Northern (Agudo-Padrón 2018a:58). Several pea clam specimens were found adhered to aquatic plants and in the sand and clay substrate of the river (Figure 1). These specimens have been deposited in the Malacological Collection of the Regional University Foundation of Blumenau – FURB, Blumenau/ SC ~ Voucher FURB-MO 361.



Figure 1.- Location of the Guaramirim Municipal District in the North region of Santa Catarina State/ SC (map – red color), native limnic/ freshwater pea clam Sphaeriidae *Eupera bahiensis* (Spix, 1827) specimens found in Rio Corticeirinha hydrographic microbasin there, and a view of the collection area.

2. June 17/18 2019: Riverside sector of the Rio Benedito hydrographic microbasin (26°46'58"S & 49°21'50"W), located in the Benedito Novo (city & Municipal District in Blumenau Micro-region), Malacological Region Number 6, Itajaí River Basin Valley (Agudo-Padrón 2018a:58). One specimen with a well-preserved ciliary forest was found on sandy substratum with many rocks (no aquatic plants nearby) (Figure 2). This specimen also has been deposited in the Malacological Collection of the Regional University Foundation of Blumenau – FURB, Blumenau/ SC ~ Voucher FURB-MO 370.

These specimens, found with the aid of Surber Sampler for Benthos during biotic sampling in the referred areas, have all been identified as native limnic/ freshwater pea clams Sphaeriidae *Eupera bahiensis* (Spix, 1827). They, now, represent the third species of the genus *Eupera* Bourguignat, 1854 recognized and counted in Santa Catarina State (Agudo-Padrón 2018:57-Table 1). These new records, along with the accompanying new record *Musculium argentinum* (d'Orbigny, 1835) (Agudo-Padrón and Carneiro 2019 – this issue), increase to eleven the regional checklist of known representatives of the family Sphaeriidae Deshayes, 1855 in the State.

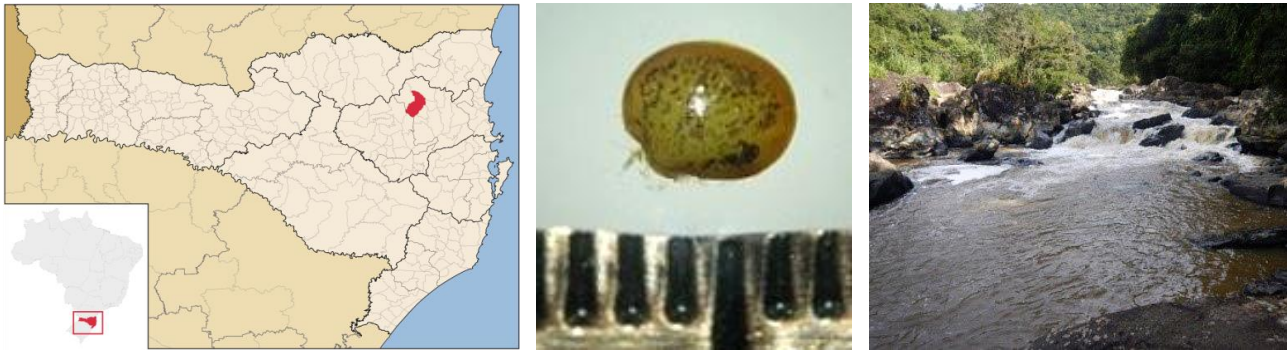
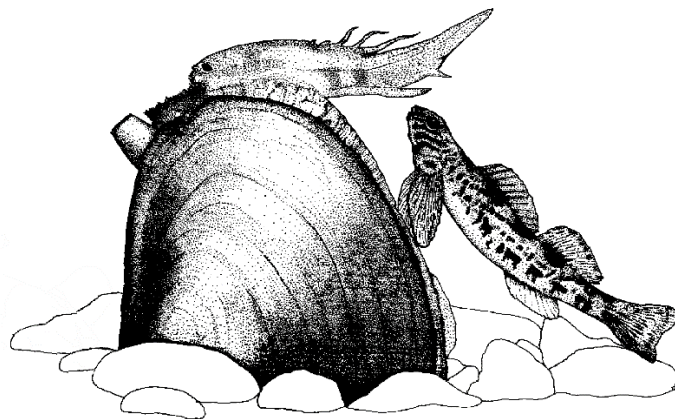


Figure 2. Location of the Rio Benedito hydrographic microbasin of the Benedito Novo Municipal District in the Itajaí River Basin Valley region of Santa Catarina State/ SC (map – red color), native limnic/ freshwater pea clam *Sphaeriidae Eupera bahiensis* (Spix, 1827) specimen that was found there, and a view of the collection area.

References:

- Agudo-Padrón, A.I. 2018. Revised and updated systematic inventory of non-marine molluscs occurring in the State of Santa Catarina/SC, Central Southern Brazil region. *Advances in Environmental Studies*, 2(1):54-60. Available online at: <http://scholarlypages.org/Articles/environmental-studies/aes-2-007.pdf?jid=environmental-studies>
- Agudo-Padrón, A.I. and Carneiro, F. 2019. First confirmed record of the native freshwater pea clam *Sphaeriidae Musculium argentinum* (d'Orbigny, 1835) in Santa Catarina State/ SC, Central Southern Brazil. *Ellipsaria*, 21(3):6-7 (this issue)
- Ishikawa, W. 2019. Bivalves Esferídeos, "Micro-Berbigões". *Planeta Invertebrados Brasil Website*. Available online at: http://www.planetainvertebrados.com.br/index.asp?pagina=especies_ver&id_categoria=27&id_subcategoria=0&com=1&id=266&local=2



Fresh-water Mussel Publications of the U.S. Bureau of Fisheries

Compiled by John J. Jenkinson

The United States Commission of Fish and Fisheries (1871-1903) and its successor the U.S. Bureau of Fisheries (1903-1940, when it was expanded to become the U.S. Fish and Wildlife Service) were created to investigate, promote, and preserve the salt- and fresh-water fisheries of the United States. From the mid-1890s through the mid-1920s, these agencies conducted a major research program designed to understand, propagate, and perpetuate freshwater mussel stocks. This program was undertaken in an attempt to maintain an adequate supply of musselshell for the pearl button industry which had sprung up during the 1890s. The research was supported and aided by the various commercial musselmen and button producers because nearly everyone involved could see that they were depleting the available mussel stocks at an alarming rate.

During the fresh-water mussel program, a wide variety of investigators studied many aspects of the physiology, natural history, regional abundance, and economic qualities of freshwater mussels. Many of those studies were published in the *Bulletin of the Bureau of Fisheries*, the (annual) *Reports of the Commissioner*, and other Bureau publication series. Most of those papers also were given Document Numbers and were issued as separates with the Document Number as the sole identification of source. In modern literature, therefore, it is not uncommon to see citations for Bureau of Fisheries Documents as well as the series in which those titles were published.

This bibliography only includes those papers published by the Commission or Bureau which include major sections on freshwater mussels, or which have "fresh-water mussel" in the title. (There are numerous short mentions of freshwater mussel studies in other Commission and Bureau publications throughout this time period, especially in the annual "Progress in Biological Inquiries" section or appendix to the *Report of the Commissioner of Fisheries*.) The complete citation for each title included here is listed by author; cross references are provided for each publication series and for the numbered Documents.

Much of the information presented here is derived from two general bibliographies of publications issued by the Commission, the Bureau of Fisheries, and the Fish and Wildlife Service. The older work by MacDonald (full citation below) covers the period 1871-1920 in superb, cross-indexed detail and is a reference work to be remembered. The later work (also cited below) covers the period 1921-1954 in less complete detail.

MacDonald, R.M.E. 1921. An analytical subject bibliography of the publications of the Bureau of Fisheries, 1871-1920. *Report of the Commissioner of Fisheries for 1920*, Appendix V, 306p. Bureau of Fisheries Doc. No. 899, issued 1921. [An indexed pdf is available on Google Scholar.]

U.S. Fish and Wildlife Service. 1955. Fishery Publications Index, 1920-1954; Publications of the Bureau of Fisheries and fishery publications of the Fish and Wildlife Service by series, authors, and subjects. *U.S. Fish and Wildlife Service, Circular No. 36*, 254p.

Abbreviations used in the citations:

Bulletin - *Bulletin of the U.S. Bureau of Fisheries*

Doc. No. - U.S. Bureau of Fisheries Document Number

Econ. Circ. - *U.S. Bureau of Fisheries, Economic Circular*

Fish. Circ. - *U.S. Bureau of Fisheries, Fisheries Circular*

Report (date) - *Report of the Commissioner of Fisheries* [and Special Papers] *for* [the fiscal year] (date)

Authors

- Blystad, Chester N. 1923. Significance of larval mantle of fresh-water mussels during parasitism, with notes on a new mantle condition exhibited by *Lampsilis luteola*. *Bulletin*, 39:203-219. Doc. No. 950, issued 1923.
- Boepple, Johann Frederick, and Robert E. Coker. 1912. Mussel resources of the Holston and Clinch Rivers of Eastern Tennessee. *Report* 1911, 13p. Doc. No. 765, issued 23 September 1912.
- Chamberlain, Thomas Knight. 1931. Annual growth of fresh-water mussels. *Bulletin*, 46:713-739. Doc. No. 1103, issued 1931.
- Churchill, E.P., Jr., and Sara I. Lewis. 1924. Food and feeding in fresh-water mussels. *Bulletin*, 39:439-471. Doc. No. 963, issued 1924.
- Clark, Howard Walton.
 1912. (See Meek and Clark, 1912; Wilson and Clark, 1912a; Wilson and Clark, 1912b.)
 1914. (See Wilson and Clark, 1914.)
 1921. (See Coker, Shira, Clark. and Howard, 1921.)
- Clark, Howard Walton, and Charles Branch Wilson. 1912. The mussel fauna of the Maumee River. *Report* 1911, 72p, 2pl. Doc. No. 757, issued 22 April 1912.
- Coker, Robert Ervin.
 1912. (See Boepple and Coker, 1912.)
 _____. 1914a. The protection of freshwater mussels. *Report* 1912, 23p, 2pl. Doc. No. 793, issued 23 July 1914.
 _____. 1914b. Water-power development in relation to fishes and mussels of the Mississippi. *Report* 1913, Appendix VIII, 28p. Doc. No. 805, issued 11 November 1914.
 _____. 1915a. Mussel resources of the Tensas River of Louisiana. *Econ. Circ.* No. 14, 7p. issued 9 April 1915.
 _____. 1915b. The common and scientific names of fresh-water mussels. *Econ. Circ.* No. 15, 4p. issued 8 April 1915.
 _____. 1916. The Fairport Fisheries Biological Station: its equipment, organization, and functions. *Bulletin*, 34:383-405, pl 75-81. Doc. No. 826, issued 7 July 1916.
 _____. 1919. Fresh-water mussels and mussel industries of the United States. *Bulletin*, 36:11-89, pl 1-46. Doc. No. 865, issued 25 October 1919.
 _____. 1921. The Fisheries Biological Station at Fairport, Iowa. *Report* 1920, Appendix I, 12p 3pl. Doc. No. 895, issued 1921.
- Coker, Robert Ervin, Austin F. Shira, Howard Walton Clark, and Arthur Day Howard. 1921. The natural history and propagation of fresh-water mussels. *Bulletin*, 37:75-181, pl 5-21. Doc. No. 893, issued 1921.
- Coker, Robert Ervin, and John B. Southall. 1915. Mussel resources in tributaries of the upper Missouri River. [and] Description of shell found in the James River at Huron, S. Dak., July 27, 1913. *Report* 1914, Appendix IV, 17p 1pl. Doc. No. 812, issued 20 March 1915.
- Curtis, Winterton Conway.
 1910. (See Lefevre and Curtis, 1910.)
 1912. (See Lefevre and Curtis, 1912.)
- Danglade, Ernest. 1912a. Condition of the mussel fishery of the Illinois River in 1912. *Econ. Circ.* No. 2, 4p, issued 20 September 1912.
 _____. 1912b. (See Wilson and Danglade, 1912.)
 _____. 1914a. (See Wilson and Danglade, 1914.)
 _____. 1914b. The mussel resources of the Illinois River. *Report* 1913, Appendix VI, 48p, 5pl, 1 map. Doc. No. 804(part), issued 30 September 1914.
 _____. 1922. The Kentucky River and its mussel resources. *Report* 1922, Appendix XI, 8p. Doc. No. 934, issued 1922.
- Eldridge, John A. 1914. The mussel fishery of the Fox River. *Report* 1913, Appendix VII, 8p. Doc. No. 804(part), issued 30 September 1914.
- Ellis, Max Mapes. 1931a. A survey of conditions affecting fisheries in the upper Mississippi River. *Fish. Circ.* No. 5, 18p.
- Ellis, Max Mapes. 1931b. Some factors affecting the replacement of the commercial fresh-water mussels. *Fish. Circ.* No. 7, 10p.

- Ellis, Max Mapes, Amanda Dickson Merrick, and Marion D. Ellis. 1931. The blood of North American fresh-water mussels under normal and adverse conditions. *Bulletin*, 46:509-542. Doc. No. 1097, issued 1931.
- Evermann, Barton Warren, and E.L. Goldsborough. 1902. Notes on the Fishes and Mollusks of Lake Chautauqua, New York. *Report* 1901:169-175. Doc. No. 483, issued 28 March 1902.
- Goldsborough, E.L.
1902. (See Evermann and Goldsborough, 19012.)
- Howard, Arthur Day. 1914. Experiments in propagation of fresh-water mussels of the *Quadrula* group. *Report* 1913, Appendix IV, 52p, 6pl. Doc. No. 801, issued 17 October 1914.
- _____. 1921. (See Coker, Shira, Clark, and Howard, 1921.)
- _____. 1922. Experiments in the culture of fresh-water mussels. *Bulletin*, 38:63-89. Doc. No. 916, issued 1922.
- Isley, Frederick B. 1914a. Experimental study of the growth and migration of fresh-water mussels. *Report* 1913, Appendix III, 24p, 3pl. Doc. No. 792, issued 23 July 1914.
- _____. 1914b. Mussel streams of eastern Oklahoma. *Econ. Circ.* No. 9, 4p, issued 17 February 1914.
- Johnson, F.F. 1934. Aquatic shell industries. *Fish. Circ.* No. 15, 17p.
- Kellogg, James L. 1892. A contribution to our knowledge of the morphology of lamellibranchiate mollusks. *Bulletin*, 10:389-436, pl 79-94. Doc. No. 204, issued 19 December 1892.
- Kunz, George Frederick. 1894. On pearls, and the utilization and application of the shells in which they are found in the ornamental arts, as shown at the World's Columbian Exposition. *Bulletin*, 13:439-457, pl 18-40. Doc. No. 278, issued 1894.
- _____. 1898a. A brief history of the gathering of fresh-water pearls in the United States. *Bulletin*, 17:321-330. Doc. No. 389, issued 1898.
- _____. 1898b. The fresh-water pearls and pearl fisheries of the United States. *Bulletin*, 17:375-426, pl 1-22. Doc. No. 397, issued 11 October 1898.
- Lefevre, George, and Winterton Conway Curtis. 1910. Experiments in the artificial propagation of fresh-water mussels. *Bulletin*, 28:615-626. Doc. No. 671, issued 1910.
- _____. 1912. Studies on the reproduction and artificial propagation of fresh-water mussels. *Bulletin*, 30:105-201, pl 6-17. Doc. No. 756, issued 10 May 1912.
- Meek, Seth Eugene. 1896. A list of fishes and mollusks collected in Arkansas and Indian Territory in 1894. *Bulletin*, 15:341-350. Doc. No. 306, issued 9 April 1897.
- _____. and Howard Walton Clark. 1912. The mussels of the Big Buffalo Fork of the White River, Arkansas. *Report* 1911, 20p. Doc. No. 759, issued 22 July 1912.
- Merrick, Amanda Dickson.
1931 (See Ellis, Merrick, and Ellis, 1931.)
- Shira, Austin F. 1913. The mussel fisheries of Caddo Lake and Cypress and Sulphur rivers of Texas and Louisiana. *Econ. Circ.* No. 6, 10p. issued 10 December 1913.
- _____. 1921. (See Coker, Shira, Clark and Howard, 1921.)
- Simpson, Charles Torrey. 1899. The pearly fresh-water mussels of the United States; their habits, enemies, and diseases, with suggestions for their protection. *Bulletin*, 18:279-288. Doc. No. 413, issued 1 November 1899.
- Smith, Hugh McCormick. 1899. The mussel fishery and pearl-button industry of the Mississippi River. *Bulletin*, 18:289-314, pl 65-85. Doc. No. 414, issued 26 October 1899.
- _____. 1919. Fresh-water mussels, a valuable national resource without sufficient protection. *Econ. Circ.* No. 43, 5p, issued 12 February 1919.
- Southall, John B.
1915. (See Coker and Southall, 1915.)
- _____. 1925. Mussel survey of Lake Pepin in 1924, with a discussion of the effects of the system of the alternate closure of sections of the lake to the taking of mussels. *Econ. Circ.* No. 57, 3p, issued April 1925.
- Surber, Thaddeus. 1913. Notes on the natural hosts of fresh-water mussels. *Bulletin*, 32:101-116, pl 29-31. Doc. No. 778, issued 28 June 1913.
- _____. 1914. Identification of the glochidia of freshwater mussels. *Report* 1912, 10p, 3 pl. Doc. No. 771, issued 1914.

_____. 1915. Identification of the glochidia of fresh-water mussels. *Report* 1914, Appendix V, 9p, 1 pl. Doc. No. 813, issued 11 March 1915.

Utterback, William Irvin. 1914. Mussel resources in Missouri. *Econ. Circ.* No. 10, 6p. issued 27 February 1914.

Wilson, Charles Branch.
1912. (See Clark and Wilson, 1912.)

_____. 1916. Copepod parasites of freshwater fishes and their economic relations to mussel glochidia. *Bulletin*, 34:331-374, pl 40-74. Doc. No. 824, issued 28 June 1916.

Wilson, Charles Branch, and Howard Walton Clark. 1912a. Mussel beds of the Cumberland River in 1911. *Econ. Circ.* No. 1, 4p, issued 13 February 1912.

_____. 1912b. The mussel fauna of the Kankakee basin. *Report* 1911, 52p, 1pl, 1 map. Doc. No. 758, issued 19 March 1912.

_____. 1914. The mussels of the Cumberland River and its tributaries. *Report* 1912, 63p, 1pl. Doc. No. 781, issued 28 January 1914.

Wilson, Charles Branch, and Ernest Danglade. 1912. Mussels of central and northern Minnesota. *Econ. Circ.* No. 3, 6p, issued 26 October 1912.

_____. 1914. The mussel fauna of central and northern Minnesota. *Report*, 1913, Appendix VIII, 28p. Doc. No. 803, issued 11 November 1914.

Winslow, Francis. 1883. Catalogue of the economic mollusca and apparatus and appliances used in their capture and preparation for market, exhibited by the United States National Museum [Great International Fisheries Exhibition, London, 1883, U.S. 1883] 86p. Doc. No. 57, issued 14 June 1883.

Series

Bulletin of the United States Bureau of Fisheries

Volume 10:

Kellogg, 1892.

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Ellis, Merrick, and Ellis, 1931.

Figure 14 from Coker, Shira, Clark, and Howard, 1921.

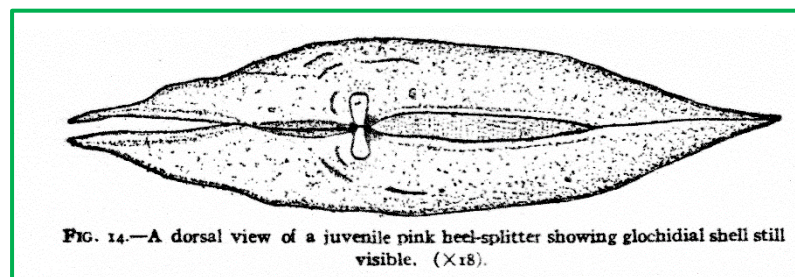


FIG. 14.—A dorsal view of a juvenile pink heel-splitter showing glochidial shell still visible. (X18).

Report of the United States Commissioner of Fisheries

Report for 1901

Evermann and Goldsborough, 1902.

Report for 1911

Boepple and Coker, 1912.

Clark and Wilson, 1912.

Meek and Clark, 1912.

Wilson and Clark, 1912.

Report for 1912

Coker, 1914.

Surber, 1914.

Wilson and Clark, 1914.

Report for 1913

Coker, 1914

Danglade, 1914.

Eldridge, 1914.

Howard, 1914.

Isley, 1914.

Wilson and Danglade, 1914.

Report for 1914

Coker and Southall, 1915.

Surber, 1915.

Report for 1920

Coker, 1921.

Report for 1922

Danglade, 1922.

U.S. Bureau of Fisheries, Economic Circular

No. 1 Wilson and Clark, 1912.

No. 2 Danglade, 1912.

No. 3 Wilson and Danglade, 1912.

No. 6 Shira, 1913.

No. 9 Isley, 1914.

No.10 Utterback, 1914.

No. 14 Coker, 1915a.

No. 15 Coker 1915b.

No. 43 Smith, 1919.

No. 57 Southall, 1925.

U.S. Bureau of Fisheries, Fisheries Circular

No. 5 Ellis, 1931a.

No. 7 Ellis, 1931b.

No. 15 Johnson, 1934.

U.S. Bureau of Fisheries Documents

Doc. No.	Author(s) and Date	Series Publication
57	Winslow, 1883.	
204	Kellogg, 1892.	<i>Bulletin</i> , 10:389-436, pl 79-94.
278	Kunz, 1894.	<i>Bulletin</i> , 13:439-457, pl 18-40.
306	Meek, 1896.	<i>Bulletin</i> , 15:341-350.
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397	Kunz, 1898b.	<i>Bulletin</i> , 17:375-426, pl 1-22.
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414	Smith, 1899.	<i>Bulletin</i> , 18:289-314, pl 65-85.
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671	Lefevre and Curtis, 1910.	<i>Bulletin</i> , 28:615-626.
756	Lefevre and Curtis, 1912.	<i>Bulletin</i> , 30:105-201, pl 6-17.
757	Clark and Wilson, 1912.	<i>Report</i> , 1911, 72p, 2 pl.
758	Wilson and Clark, 1912.	<i>Report</i> , 1911, 52p 1 pl, 1 map.

759	Meek and Clark, 1912.	<i>Report</i> , 1911, 20p.
765	Boepple and Coker, 1912.	<i>Report</i> , 1911, 13p.
771	Surber, 1914.	<i>Report</i> , 1912, 10p, 3 pl.
778	Surber, 1913.	<i>Bulletin</i> , 32:101-116, pl 29-31.
781	Wilson and Clark, 1914.	<i>Report</i> , 1912, 63p, 1pl.
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793	Coker, 1914a.	<i>Report</i> , 1912, 23p, 2 pl.
801	Howard, 1914.	<i>Report</i> , 1913, Appendix IV, 52p, 6 pl.
803	Wilson and Danglade, 1914.	<i>Report</i> , 1913, Appendix V, 26p, 1 map.
804	Danglade, 1914b <i>and</i> Eldridge, 1914.	<i>Report</i> , 1913, Appendix VI, 48p, 5 pl. 1 map <i>Report</i> , 1913, Appendix VII, 8p.
805	Coker, 1914b.	<i>Report</i> , 1913, Appendix VIII, 28p.
812	Coker and Southall, 1915.	<i>Report</i> , 1914, Appendix IV, 17p, 1 pl.
813	Surber, 1915.	<i>Report</i> , 1914, Appendix V, 9p, 1 pl.
824	Clark and Wilson, 1912.	<i>Bulletin</i> , 34:331-374, pl 40-74.
826	Coker, 1916.	<i>Bulletin</i> , 34:383-405, pl 75-81.
865	Coker, 1919.	<i>Bulletin</i> , 36:11-89, pl 1-46.
893	Coker, Shira, Clark, and Howard, 1921.	<i>Bulletin</i> , 37:75-181, pl 5-21.
895	Coker, 1921a.	<i>Report</i> , 1920, Appendix I, 12p, 3 pl.
916	Howard, 1922.	<i>Bulletin</i> , 38:63-89.
934	Danglade, 1922.	<i>Report</i> , 1922, Appendix XI, 8p.
950	Blystad, 1923.	<i>Bulletin</i> , 39:203-219.
963	Churchill and Lewis, 1924.	<i>Bulletin</i> , 39:439-471.
1097	Ellis, Merrick, and Ellis, 1931.	<i>Bulletin</i> , 46:509-542.
1103	Chamberlain, 1931.	<i>Bulletin</i> , 46:713-739.

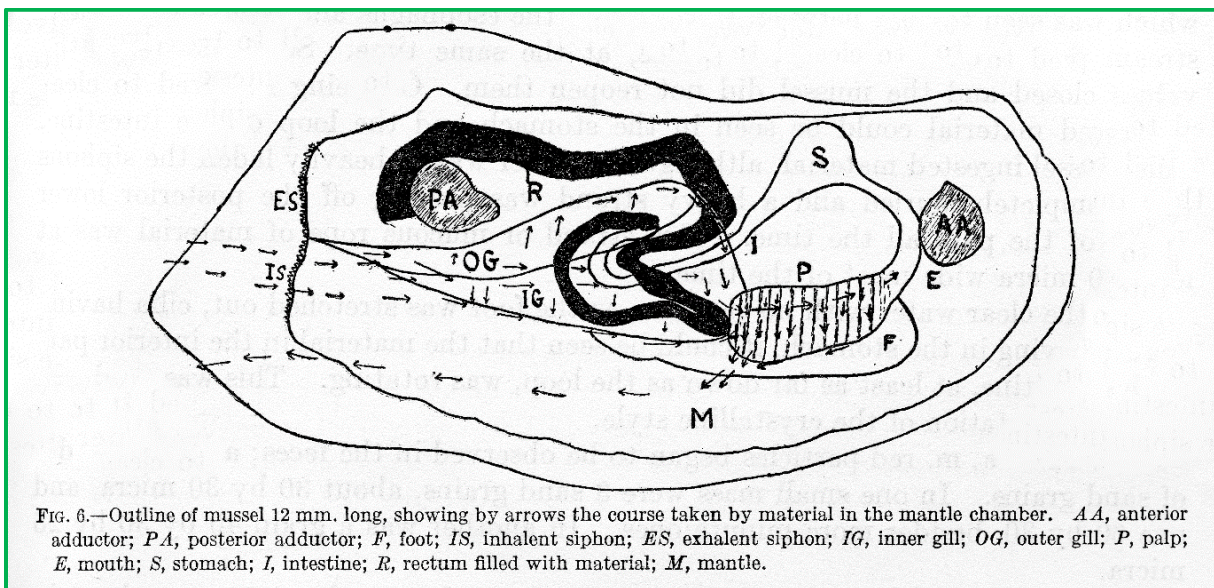


Figure 6 from Churchill and Lewis, 1924

FMCS Officers

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1816 South Oak Street
Champaign, Illinois, USA 61820
jtiemann@illinois.edu

President Elect

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Missouri Department of Conservation
3500 East Gans Road
Columbia, Missouri, USA 65201-8992
stephen.mcmurray@mdc.mo.gov

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PO Box 67
Elkins, West Virginia, USA 26241
Janet.l.clayton@wv.gov

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Office of Planning and Analysis
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Potsdam, New York, USA 13699-5557
adchrist@clarkson.edu

Past President

Heidi L. Dunn

EcoAnalysts, Inc.
1417 Hoff Industrial Park
O'Fallon, Missouri, USA 63366
HDunn@ecoanalysts.com

Ellipsaria is posted on the FMCS web site quarterly: around the first of March, June, September, and December. This newsletter routinely includes Society news, meeting notices, pertinent announcements, and informal articles about ongoing research concerning freshwater mollusks and their habitats. Anyone may submit material for inclusion in *Ellipsaria* and all issues are accessible to anyone on the FMCS website (<http://molluskconservation.org>).

Information for possible inclusion in *Ellipsaria* should be submitted via e-mail to the editor, John Jenkinson, at jjjenkinson@hotmail.com. Contributions may be submitted at any time but are due by the 15th of the month before each issue is posted. MSWord is optimal for text, but the editor may be able to convert other formats. Graphics should to be in a form that can be manipulated using PhotoShop. Please limit the length of informal articles to about one page of text. Note that submissions are not peer-reviewed but are checked for clarity and appropriateness for this freshwater mollusk newsletter. Feel free to contact the editor with questions about possible submissions or transmission concerns.

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If you are interested in participating in committee activities, please contact one of the appropriate chairs.

Standing Committees

Awards

Emy Monroe - emy_monroe@fws.gov
 Susan Oetker - susan_oetker@fws.gov
 David Hayes - david.hayes@eku.edu
 Curt Elderkin - elderkin@tcnj.edu

Environmental Quality & Affairs

Braven Beaty - bbeaty@tnc.org
 Mickey Matthews -
mickey.matthews@ahtd.ar.gov

Gastropod Status and Distribution

Nathan Whelan - Nathan_Whelan@fws.gov
 Wesley Daniel - wdaniel@usgs.gov

Genetics

Dave Zanatta - zanat1d@cmich.edu
 Kevin Roe - kjroe@iastate.edu

Guidelines and Techniques

Ryan Schwegman -
RSchwegman@EnviroScienceInc.com
 Lisie Kitchel -
lisie.kitchel@wisconsin.gov

Information Exchange

Journal

W. Gregory Cope - greg_cope@ncsu.edu
 Wendell R. Haag - whaag@fs.fed.us
 Dave Berg - bergdj@miamioh.edu

Newsletter

John Jenkinson - jjjenkinson@hotmail.com

Mussel Status and Distribution

Gerry Dinkins - Gdinkins@utk.edu
 Jason Wisniewski - jason.wisniewski@tn.gov

Nominations

[Vacant at Present]

Outreach

Jennifer Archambault - jmarcham@ncsu.edu
 Amy Maynard -
Amy.Maynard@dgif.virginia.gov

Propagation, Restoration, & Introduction

Rachael Hoch - rachael.hoch@ncwildlife.org
 Tim Lane - tim.lane@dgif.virginia.gov
 Maddie Pletta - madeline.pletta@state.mn.us

Symposium

Steve McMurray -
stephen.mcmurray@mdc.mo.gov

Ad Hoc Committees

Chapters

Manuel Lopes-Lima -
lopeslima.ciimar@gmail.com

Diversity and Inclusiveness

Tamara Smith - tamara_smith@fws.gov

Ecosystem Services

Carla Atkinson - carlalatkinson@gmail.com

Monetary Values

Megan Bradley - megan_bradley@fws.gov

Professional Development

Rebecca Winterringer -
beccawint6@gmail.com
 Amanda Rosenberger -
arosenberger@tntech.edu

Parting Shot



This historical marker is located along Market Street in downtown Clinton, Tennessee, not far from the banks of the Clinch River. Many long-time residents remember their parents talking about locally-found pearls and what “big city” folks would pay for them. The ending date for the pearl market on this sign (1936) is precise because that is the year when Norris Dam was closed upstream from Clinton and flow in the Clinch River was reduced for several months to the input from a few below-dam creeks. When checked in October 1936, the previously robust and diverse mussel fauna in the river (at least 45 species) that had produced the pearls and shells for the button industry was dead (A.R. Cahn unpublished report). Photograph by John Jenkinson.

If you would like to contribute a freshwater mollusk-related image for use as a **Parting Shot** in *Ellipsaria*, e-mail the picture, informative caption, and photo credit to jjjenkinson@hotmail.com.

