

The James River Basin *Past, Present and Future*

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Mollusks

by

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MOLLUSKS are a group of animals which appeared early in the Paleozoic Era and at present number over 70,000 named species (and subspecies). Of approximately 6,000 species reported within the borders of continental United States, 4,000 species are land or freshwater dwellers, the remaining are marine. Prior to this paper, 44 species have been reported from the James River Basin—mostly from Rockbridge, Bedford, and Amherst counties. This report, which is far from complete, lists 145 species from 27 of the 43 counties of the area. All of these have living representatives and belong to two of the five Classes of Mollusca, namely: Gastropoda—Snails and Slugs; and Pelecypoda—Mussels and Pill Clams. Mollusks are soft-bodied animals which have a foot as their locomotor organ and, excepting Slugs, carry a shell with them into which they can retreat. The Slugs have never had an external shell and are not, "snails which have crawled out of their shells." They do have a shell, but it is internal. Like other animals, Mollusks have digestive, respiratory, nervous, excretory, reproductive, muscular, and blood systems. The external skin-like covering called mantle also lines the shell and secretes it. The foot secretes mucus which is deposited as a roadway over which the snail or Slug makes its way by means of wave-like peristaltic motion. The head of Snail or Slug has two pairs of antennae-like tentacles, the longer of which bears eyes. On the right side of the body of the snail is a hole which is the opening to the lung. The mouth is on the under side of the head and has a rasping tongue covered with thousands of hard teeth which are used to scrape food from the plants and animals which they eat. Most of the Snails and Slugs are hermaphrodite, i. e., bearing both male and female germ glands and reproductive organs. The fertilized eggs of land forms are deposited during the summer months and are generally hatched in early Fall. They spend the winter on the ground, under rocks or logs or other cover and usually mature within two years. Very few live much longer than two years. The eggs of the water snails are deposited in masses of jelly on solid objects in water in Spring, Summer or Fall. Those of one species are born alive. The mussels lack head and tentacles but do have a sense organ around the mouth and a balancing organ in the foot. They are gill breathers. Sexes are separate and the gills of the female serve as a marsupium in which the eggs develop into larvae called glochidia. These glochidia

attach themselves to the gills of fish where they remain for weeks or months and during development are carried great distances before they drop off, become adults and settle down to a sedentary existence. Their food and oxygen come from the current of water continually drawn into their shells by the beating of cilia on their gills. Snails do not have direct economic importance but serve as food for other animals and as hosts for certain parasites of man and domestic animals. Land snails are not large enough or plentiful enough to serve as human food, but birds, salamanders, mice, moles, shrews, and squirrels eat them. Aquatic snails furnish food for fish and other animals. Approximately 20% of fish feed more or less on snails. F. C. Barker in 1916 (Bull. 4, N. Y. State Coll. Forestry) stated that "more than 40 species of Mollusks are now known to be used as food by our common and game fish." Mussels serve as food for muskrat, mink, racoon, and some birds. The Indians ate them but civilized man has not acquired a taste for them (although the author and some of his friends have found them very good in the form of chowder.) The pill clams form a large part of the food of many valuable game and food fish, either directly or indirectly, such as the Black Bass, Common Sucker, Yellow Perch, Pike, and Red Horse.

Land snails and slugs may be found almost anywhere provided they can get there, even in places which would seem too dry to support any life at all. Forested bluffs along rivers having outcrops of limestone seem to be most favorable habitats. Land snails are found at elevations of over 4,000 feet in Giles, Craig, and Augusta Counties, and almost at sea level near the sandy beaches of the eastern coast. Most snails are associated with distinctive kinds of environment and are found in greater numbers in forests of beech, buckeye, and tulip trees but it seems that presence of shelter, moisture, limestone are the three most important limiting factors. If these conditions are satisfactory and civilization has not encroached too much, land snails are usually found in great abundance and variety. Pond snails are found from sea level up to approximately 4,000 feet, and even in cold lakes. I have not seen the stream-dwelling operculate snails or mussels higher than 2,000 feet, but pill clams are found in the highest springs such as the one at over 4,000 feet furnishing water for Mountain Lake Biological Station in Giles County. Certain introduced species of snails and slugs and a few others live in gardens, in hedge rows and under almost any object which will afford protection from light, heat, drying and enemies. From these hiding places they raid gardens, orchards, and cellars where food can be found. Experiments have shown that the Striped Garden Slug can detect a rotten apple fifty yards away. John Taylor in, "Mollusca of the British Isles" 1916, tells of the food preferences of snails from among nearly 200 kinds of plants and animals. They eat a great variety of foods. In our area it seems that the mycelia

of fungi are the preferred food of most land snails. They even feed on the poisonous mushroom *Russula emetica*. Mussels eat almost any organic detritus which enters the shell. Sewage in small quantities is eaten, but large quantities, such as dumped into rivers by some cities kills all mussels. In comparison with other areas the James River Basin has about as many species as reported from other states but less than the Ohio River drainage area in Southwest Virginia. The greater number of species in the latter may be more apparent than real and may be due to more extensive investigation nearer his home by the author. Or it may mean that Mollusks evolved and migrated north and northeast and have not yet been able to get into the James River Basin. In the four counties—Pulaski, Giles, Craig and Montgomery more than 150 species have been identified by the author.

The Mollusks of the area belong to two Classes: Gastropoda: Snails and Slugs; and Pelecypoda: Mussels and Pill Clams. The Mollusks are represented by four Orders: Pulmonata—lung breathers, Prosobranchiata—gill breathers, Telleodermacea—Pill Clams, and Pliodermacea—Mussels. These four Orders comprise 23 Families, 55 Genera, and 145 Species and Sub-species.

Classification and county records follow.

A. Order Prosobranchiata

Family Helicinidae

Hendersonia occulta Say, Rockbridge and Augusta counties.

Family Viviparidae

Campeloma decisum Say, Amherst, Craig and Rockbridge counties.

C. integra, Say, Cumberland, Fluvanna.

Family Pleuroceridae

Goniobasis symmetrica Haldeman, Botetourt and Rockbridge.

G. sordida Say, Augusta.

G. virginica Gmelin, Amherst and Chesterfield.

Nitocris carinata Brugiere, Albemarle, Alleghany, Bath, Botetourt, Craig, Fluvanna, Highland, Rockbridge.

N.c. monodonta Conrad, Alleghany, Amherst, Craig, Botetourt, Chesterfield, Fluvanna, Rockbridge.

Stimsona nickliana Lea, Bath.

Family Ellobidae

Carychium exile Lea, Alleghany, Amherst, Augusta, Botetourt, Rockbridge.

Melampus bidentatus Say, Norfolk.

M. floridanus Adams, Norfolk.

B. Order Pulmonata

Family Lymneidae

- Fossaria obrussa* Say, Campbell, Giles.
F. galbana Say, Rockbridge.
F. humilis Say, Botetourt, Campbell, Highland, Rockbridge.
Pseudosuccinea columella Say, Alleghany, Fluvanna.
Stagnicola palustris eloides (Say), Campbell.
 Family Planorbidae
Gyraulus hirsutus (Gould), Chesterfield, Craig, James City.

- G. parvus* Say, Botetourt, Rockbridge.
Helsoma anceps Haldeman, Amherst, Louisa, Rockbridge.
H. a. unicarinata Haldeman, Alleghany, Botetourt, Rockbridge.
H. antrosa Conrad, Augusta, Alleghany, Craig.
H. trivolvis Say, Norfolk.

Family Physidae

- Physella elliptica aurea* Lea, Bath, Louisa, Rockbridge.
P. heterostropha Say, Alleghany, Augusta, Bath, Botetourt, Craig, Henrico, James City, Norfolk, Rockbridge.

Family Pupillidae

- Columella edentula* Binney, Augusta, Giles, Fluvanna.
Gastrocopta armifera Say, Albemarle, Alleghany, Amherst, Augusta, Dinwiddie, Giles, Norfolk, Rockbridge.
G. corticaria Say, Alleghany, Augusta.
G. contracta Say, Albemarle, Alleghany, Augusta, Highland, Nelson, Norfolk.
G. holzingeri Sterki, Rockbridge.
G. pellucida hordeacella Pilsbry, Norfolk.
G. pentodon Say, Alleghany, Amherst, Augusta, Campbell, Elizabeth City.
G. procer H. & J., Alleghany, Nelson, Norfolk.
Pupoides marginata Say, Alleghany, Amherst, Augusta, Dinwiddie, Highland, Norfolk.
Verigo gouldii Binney, Giles.
V. milium Gould, Norfolk.
V. ovata Say, Norfolk.
V. parvula Sterki, Rockbridge.
V. bollesiana (Morse), Norfolk.

Family Succineidae

- Succinea aurea* Lea, Norfolk.
S. avara Say, Elizabeth City.
S. ovalis Say, Albemarle, Augusta, Rockbridge.
S. reusa Lea, Dinwiddie.

Family Endodontidae

- Anguispira alternata* Say, Alleghany, Giles, Norfolk, Elizabeth City.
A. a. costata Lewis, Giles.
A. a. angulata Pilsbry, Amherst, Augusta, Bath, Nelson, Rockbridge.
A. a. mordax R. & Rhoads, Alleghany, Bath, Botetourt, Rockbridge, Sussex.
Discus patulus Deshayes, Alleghany, Amherst, Craig, Fluvanna, Giles, Goochland, Henrico, James City, Louisa, Rockbridge.
Mesomphix cupreus Rafinesque, Alleghany, Augusta, Bath, Craig, Giles, Rockbridge.
M. kapnodes Pilsbry, Rockbridge.
M. inornatus Say, Bath, Botetourt, Craig, Fluvanna, Giles, Highland, Nelson, Rockingham.
M. perlaevis vulgatus H. B. Baker, Albemarle, Alleghany, Bath, Elizabeth City, Giles, Nelson.
Punctum minutissimum Lea, Albemarle, Amherst, Augusta, Campbell, Dinwiddie, Fluvanna.
P. vitreum H. B. Baker, Bath.
 Family Cochlicopidae (Cionellidae)
Cochlicopa (*Cionella*) *lubrica* (Muller), Alleghany, Augusta, Bath, Fluvanna, Giles, Nelson, Rockbridge.
 Family Valloniidae
Vallonia costata Muller, Augusta, Norfolk.
V. excentrica Sterki, Alleghany, Craig, Norfolk.
V. parvula Sterki, Augusta.
 Family Philomycidae
Pallifera dorsalis Binney, Nelson, Norfolk, Rockbridge.
Philomycus carolinensis Binney, Albemarle, Amherst, Craig, Fluvanna, Giles, Louisa, Montgomery, Norfolk, Rockbridge.
 Family Limacidae
Deroceras laeve Muller, Campbell, Norfolk.
Limax flavus L., Albemarle, Bath, Campbell, Henrico, Norfolk.
L. maximus L., Campbell, Rockbridge (perhaps all cities of JRB.)
 Family Zonitidae
Euconulus chersinus Say, Albemarle, Alleghany, Augusta, Craig, Elizabeth City, Goochland, Louisa, Highland, Nelson.
E. c. dentatus Sterki, Amherst, Rockingham.

- E. fulvus* Muller, Amherst, Bath, Botetourt, Goochland, Nelson.
- Guppya sterkii* (Dall), Rockingham.
- Hawaita minuscula* Binney, Amherst, Alleghany, Bath, Dinwiddie, Elizabeth City, Highland, Nelson, Norfolk.
- Paravireta capsella* (Gould), Albemarle, Alleghany, Bath, Botetourt, Fluvanna, Giles, Nelson.
- P. multidentata* Binney, Rockbridge.
- P. pontis* H. B. Baker, Alleghany, Rockbridge.
- Retinella carolinensis* Cockerell, Nelson, Rockbridge.
- R. c. wetherbyi* Cockerell, Giles.
- R. burringtoni* Pilsbry, Giles, Louisa, Rockbridge.
- R. electrina* Gould, Albemarle, Augusta, Bath, Botetourt, Elizabeth City.
- R. indentata* Say, Albemarle, Alleghany, Amherst, Augusta, Botetourt, Craig, Fluvanna, Giles, Elizabeth City, James City, Nelson, Norfolk.
- R. i. paucilirata* Morelet, Craig, Dinwiddie, Louisa.
- R. rhoadsi* Say, Alleghany, Amherst, Bath, Botetourt, Giles, Rockbridge.
- R. i. austrina* H. B. Baker, Amherst, Rockbridge.
- Striatura ferrea* Morse, Craig.
- S. meridionalis* P. & H., Albemarle, Alleghany, Amherst, Fluvanna, Giles, Louisa, Rockbridge, Rockingham.
- Oxychilus draparnaldi* Beck, Norfolk.
- Ventridens acerrus* Lewis, Botetourt, Craig, Giles, Rockbridge.
- V. arboreus* Say, Albemarle, Alleghany, Augusta, Campbell, Craig, Dinwiddie, Fluvanna, Giles, Henrico, Louisa, Nelson, Norfolk, Prince George, Rockbridge, Rockingham.
- V. collicela* Pilsbry, Amherst, Dinwiddie, Rockingham.
- V. demissus* (Binney), Alleghany, Amherst, Augusta, Craig, Elizabeth City, Giles, James City, Norfolk, Rockbridge.
- V. intertextus* Binney, Amherst, Bedford.
- V. cerionoides* Anthony, Norfolk.
- V. ligerus* Say, Amherst, Augusta, Botetourt, Giles, Elizabeth City.
- V. limatulus* Ward & Binney, James City.
- V. suppressus* Say, Albemarle, Alleghany, Bath, Botetourt, Craig, Elizabeth City, Giles, Louisa, Nelson, Rockbridge.
- V. s. virginicum* Vanatta, Amherst, Augusta, Rockbridge.
- V. s. magnidens* Pilsbry, Amherst, Augusta, Rockbridge.
- V. virginica* Vanatta, Albemarle, Alleghany, Nelson.

- Family Strobilopsidae
- Strobilops aenea* Pilsbry, Fluvanna, Goochland, Louisa, Norfolk.
- S. labrynthica* Say, Amherst, Louisa, Nelson, Norfolk.
- Family Haplotrematidae
- Haplotrema concava* Say, Albemarle, Alleghany, Amherst, Augusta, Bath, Botetourt, Chesterfield, Craig, Dinwiddie, Fluvanna, Giles, Henrico, Highland, James City, Louisa, Nelson, Rockbridge.
- Family Polygyridae
- Allogona profunda* Say, Craig, Rockbridge.
- Mesodon appressa* Say, Rockbridge.
- M. a. laevior* Pilsbry, Dinwiddie.
- M. a. sculptior* Pilsbry, Amherst, Bedford, Giles.
- M. andrewsae normalis* Pilsbry, Craig, Giles.
- M. inflecta* Say, Botetourt.
- M. mitchellianus* Lea, Amherst.
- M. rugeli* Shuttleworth, Campbell, Giles, Rockbridge.
- M. thyroideus* Say, Alleghany, Amherst, Augusta, Campbell, Dinwiddie, Giles, Elizabeth City, Fluvanna, Henrico, James City, Louisa, Norfolk, Rockbridge.
- M. t. sanctisimonis* (Say), Bath, Craig.
- Stenotrema fraterna* (Say), Amherst, Bath, Rockbridge.
- S. hirsuta* Say, Albemarle, Alleghany, Amherst, Augusta, Bath, Elizabeth City, Giles, Goochland, Henrico, Highland, Louisa, Nelson, Rockbridge, Rockingham.
- S. monodon aliciae* Pilsbry, Alleghany, Craig.
- S. stenotrema* Pfeiffer, Alleghany, Amherst, Craig, Giles, Rockbridge.
- Triodopsis albolabris* Say, Albemarle, Alleghany, Augusta, Amherst, Bath, Botetourt, Campbell, Craig, Elizabeth City, Fluvanna, Giles, Goochland, James City, Louisa, Norfolk, Rockbridge.
- T. a. traversensis* Walker, Elizabeth City.
- T. dentifera* Binney, Craig, Giles.
- T. fallax* Say, Albemarle, Campbell, Dinwiddie, Fluvanna, Henrico, James City, Rockbridge.
- T. fraudulenta* Pilsbry, Alleghany, Augusta, Campbell, Craig, Giles, Highland, Rockbridge, Rockingham.
- T. f. vulgata* Pilsbry, Alleghany, Amherst, Augusta, Campbell, Giles, Highland, Rockbridge, Rockingham.
- T. hopetonensis chingoteguensis* Shuttleworth, Norfolk.
- T. tridentata* Say, Alleghany, Amherst, Augusta, Bedford, Bath, Craig, Giles, Highland, Nelson, Rockbridge.
- T. t. bidentata* F. C. Baker, Amherst, Botetourt.

- T. t. edentilabris Pilsbry, Alleghany, Bath, Botetourt, Campbell, Giles, Highland, Rockbridge.
- T. t. juxtidentis Pilsbry, Albemarle, Alleghany, Amherst, Augusta, Bath, Bedford, Botetourt, Campbell, Craig, Dinwiddie, Fluvanna, Giles, Louisa, Nelson, Norfolk, Rockbridge.
- T. t. unidentata F. C. Baker, Alleghany, Amherst, Augusta, Bath, Campbell, Giles, Highland, Nelson.
- Family Helicidae
- Cepea nemoralis L., Augusta, Bath, Campbell, Rockbridge.

CLASS PELECYPODA

C. ORDER Prionodesmacea

Family Unionidae

- Alasmidonta collina Lamarck, Rockbridge.
- Anodonta cataracta Say, Cumberland.
- A. undulata Say, Prince George.
- Elliptio complanatus Dillwyn, Chesterfield, Craig, Fluvanna, Louisa, Prince George, Rockbridge.
- E. productus Conrad, Chesterfield.
- E. lanceolatus Lea, Rockbridge.
- Lampsilis constricta Conrad, Rockbridge.
- Pleurobena subplanum (Conrad), Chesterfield, Rockbridge.
- Strophitus fisherianus Lea, Rockbridge.

D. ORDER Teleodesmacea

Family Sphaeriidae

- Musculum partumeium Prime, Henrico, Norfolk.
- Pisidium abditum Haldeman, Giles.
- P. compressum Prime, Craig.
- P. virginicum Gmelin, Craig, Fluvanna.
- Sphaerium fabale Prime, Fluvanna.
- S. striatinum Lamarck, Craig.

The conchologists H. A. Pilsbry, W. G. Binney, H. B. Baker, Conrad, Clench, and Archer have collected in Rockbridge. Other collectors in Rockbridge County: J. B. Clark, Jas. A. Morrison, M. McDonald, H. N. Wardle, Carl McConnell, T. D. Cockerell; in Norfolk (area): S. N. Rhoades, H. B. Meredith, Leslie Hubricht; in Craig: Wm. E. Hughes; in Bath and Giles: P. P. Calvert. Thirty-two of the forty-four species mentioned prior to this report came from Rockbridge, in the vicinity of Lexington or of Natural Bridge. The other

twelve species came from five counties: Norfolk, Bedford, Amherst, Craig, and Giles. For the present report I am indebted to present and former Curators of Mollusks, Drs. Harold Rehder and Paul Bartsch of the U. S. National Museum for many courtesies and to Associate Curator, Dr. J. P. E. Morrison for identification of many species and for much helpful information. The extensive collections would not have been possible without the help of many friends and students, nor without the Fellowships provided by the Mountain Lake Biological Station of the University of Virginia under the Direction of Dr. Ivey F. Lewis and Dr. Bruce D. Reynolds. I am especially indebted to Dr. J. C. Strickland, Col. Robt. P. Carroll, Mr. Wm. Ferrell, my wife, Doris, our children, David, Jack, Teddy, Donald and Mary for specimens and active help on many expeditions. Miss Josephine Stewart collected the Elizabeth City County specimens. Mr. Robert Hoffman furnished some of the specimens from Alleghany and Augusta Counties.

No descriptions, figures nor ecological data for species have been included because these data are to be found in the excellent monographs listed below. Anyone interested in any of the species listed above is advised to consult the indexes of these comprehensive works.

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