

The Naiad-Fauna of Duck River in Tennessee.

BY DR. A. E. ORTMANN.

Duck River in central Tennessee is one of the most important tributaries of the Tennessee River. It has the peculiarity of running in an east-westerly direction, and joining the Tennessee in that part of its course, which is directed across the state from South to North, while other tributaries of this region run essentially in a southerly or southwesterly direction, flowing into Alabama and uniting with the master stream at, and for some distance above, the Mussel Shoals.

The sources of Duck River are in the part of the Cumberland Plateau (in its widest sense), called the *Highland Rim*, at an elevation of about 1200 feet (see U. S. Topogr. Atlas sheet Hollow Springs), that is to say rather low as compared with other streams of this region. The Highland Rim consists largely of Lower Carboniferous siliceous limestones (Mississippian). Flowing then, in the main, in a direction somewhat north of west, it traverses in a valley of entrenched meanders the *Nashville Dome* (or the interior basin of Central Tennessee), consisting of Middle and Upper Ordovician rocks, reaching, between Columbia and Centreville, again the Mississippian Highland Rim of the western flank of the dome, and continuing in it to its junction with the Tennessee.

The greatest part of its drainage is in this central basin, only *Buffalo River*, its largest tributary, is entirely in the western portion of the Highland Rim. I visited the latter only on its headwaters. Of other tributaries, I am acquainted with *Big Bigby Creek* and *Rutherford Creek* in Maury Co.; with *Rock Creek* in Marshall Co.; *Garrison Creek* and *Thompson Creek* in Bedford Co. (all these in the interior basin); and *Little Duck River*, Coffee Co. (eastern part of Highland Rim); but I found Naiades only in *Buffalo River* and *Garrison Creek*.

In the main river, however, Naiades are abundant, and I collected at eleven stations, from Centreville to Manchester,

mostly with gratification, no pollution of lumber and Centreville water to be seen. In the latter case the injurious effect was not so great, the gray shells, and the abundance, often towards the head, decreases, and the numbers are small.

Duck River in Kentucky and Alabama, might be two systems, but I found no forms (Mississippian and "Canadian"). And indeed, some there are other regions, chiefly of forms. I thought study with an inv Duck River. The subsequent general Naiad-fauna, the Rivers. †

Our previous very unsatisfactory observations on the

More about these

† The principal fauna, and are large Wilson, C. B. and C and its Tributaries. A. E. The Naiades of Philos. Soc. 57. 1918.

River in Tennessee.

MANN.

one of the most important. It has the peculiarity of joining the Tennessee River which is directed across the river tributaries of this region in a southwesterly direction, with the master stream at Mussel Shoals.

In the part of the Cumberland called the *Highland Rim*, (see U. S. Topogr. Atlas) it is rather low as compared with the *Highland Rim*. The *Highland Rim* consists of siliceous limestones (Mississippian), in a direction somewhat parallel to the line of entrenched meanders of the central basin of the Tennessee. Ordovician rocks, reaching from Centreville, again the Mississippi River, to the Tennessee.

The *Highland Rim* is in this central basin, and its tributary, is entirely in the Tennessee. I visited the latter only at Centreville, I am acquainted with *Little Creek* in Maury Co.; with *Wilson Creek* and *Thompson Creek* (in the interior basin); and with the northern part of *Highland Rim*; *Duck River* and *Garrison Creek*. Naiades are abundant, and I collected them from Centreville to Manchester,

mostly with great success. Duck River is in very good condition, no pollution entering it, except in the region between Columbia and Centreville, where Phosphate mines send muddy water to it; but the amount of pollution is small, and its character obscure, and only at Centreville some indication of an injurious effect was noticed. For the rest, Naiad-life was plentiful, the gravel bars were covered with large numbers of dead shells, and the living ones were found at the proper places in abundance, often closely crowded together. Of course, towards the headwaters, the number of species and individuals decreases, and at Manchester there was only one species in small numbers.

Duck River being located between Cumberland River in Kentucky and Tennessee, and Tennessee River in northern Alabama, might be expected to contain a similar fauna to these two systems, a fauna which is known to contain peculiar elements, not found outside of this region in the Central Basin (Mississippi and Ohio drainages), which might be called "Cumberlandian" types (from the "Cumberland subregion").* And indeed, some of them are present. But I have found that there are other constituents in this fauna, and in view of our poor knowledge of the Naiad-fauna of the Cumberland subregion, chiefly of the exact distributional facts of the various forms, I thought it might be desirable, to connect the present study with an investigation of the zoogeographical affinities of Duck River. The material thus presented will be useful for a subsequent general study of the history of the Cumberland Naiad-fauna, the fauna of the Cumberland and Tennessee Rivers. †

Our previous knowledge of the Naiades of Duck River is very unsatisfactory. Lea, in his publications collected in "Observations on the Genus *Unio*," mentions four species: *U. big-*

* More about these will be found toward the end of this paper.

† The principal papers published more recently, which treat of this fauna, and are largely cited in the following pages, are the following: Wilson, C. B. and Clark, H. W. The Mussels of the Cumberland River and its Tributaries (Bur. of Fisher. Doc. 781. 1914. 63 pp.). Ortmann, A. E. The Naiades of the Upper Tennessee Drainage, Etc. (Proc. Amer. Philos. Soc. 57. 1918. pp. 521-626).

byensis Lea '41 (Obs. 3, '42) from Big Bigby Creek, Maury Co.; *U. clarkianus* Lea '52 (Obs. 5, '52) from Williamsport, Maury Co.; *U. cylindrellus* Lea '68 (Obs. 12, '69); and *U. validus* Lea '71 (Obs. 13, '74), both from "Duck River, Tenn." Of these, *U. clarkianus* (*Lampsilis clarkiana*) should be canceled (already questioned by Simpson), the locality apparently being erroneous, this shell belonging to the headwaters of the Alabama drainage. The other three species stand now as *Fusconia barnesiana bigbyensis*, *Carnuculina cylindrella*, and *Fusconala barnesiana*, their presence in Duck River being confirmed by my observations.

In 1885, Hinkley and Marsh* published a list of Naiades from central Tennessee. Unfortunately, the identifications are not all reliable, and in several cases it remains doubtful, which species were intended. A number of these shells came from Duck River at Columbia, Maury Co., Tenn., and it has been possible to recognize many of them according to my own collections made at Columbia and in Duck River in general. They are the following, arranged according to the modern system and the modern nomenclature:

- | | |
|--|--|
| 1. <i>Fusconia barnesiana</i> (as <i>U. barnesianus</i> and <i>validus</i>) | 11. <i>Pleurobema cordatum pyramidatum</i> |
| 2. <i>Megalionaias gigantea</i> (as <i>multiplicatus</i>) | 12. <i>Pleurobema oviforme</i> (as <i>clinchensis</i> , <i>lesleyi patulus</i>) |
| 3. <i>Amblyma costata</i> (as <i>undulatus</i>) | 13. <i>Pleurobema oviforme holstonense</i> (as <i>pattinoides</i>). |
| 4. <i>Quadrula pustulosa</i> | 14. <i>Eliptio crassidens</i> (as <i>gibber</i>) |
| 5. <i>Quadrula fragosa</i> | 15. <i>Eliptio dilatatus</i> (as <i>gibbosus</i>) |
| 6. <i>Quadrula verrucosa</i> (as <i>tuberculatus</i>) | 16. <i>Lastena lata</i> (as <i>dehiscens</i>) |
| 7. <i>Quadrula intermedia</i> | 17. <i>Lasmigona costata</i> (as <i>rugosa</i>) |
| 8. <i>Quadrula cylindrica</i> | 18. <i>Strophitus rugosus</i> (as <i>schaffermana</i>) |
| 9. <i>Cyclonaias tuberculata</i> (as <i>verrucosus</i>) | |
| 10. <i>Lexingtonia doiabelloides</i> (as <i>circumactus</i>) | |

* Hinkley, A. A. and Marsh, P. List of Shells Collected in Central Tennessee (Aledo, Ill. July, 1885). This paper has been overlooked by Simpson in the bibliography published in his "Synopsis" (1900). My attention has been called to it by C. Goodrich, Toledo, who also kindly loaned me his copy of it.

19. *Ptychobranchi camelus*)
20. *Ptychobranchi*
21. *Obliquaria retus*)
22. *Cyprogenia ir*
23. *Obovaria retu*
24. *Obovaria subcensus*)
25. *Actionaias pe dir*)
26. *Plagiola linco*
27. *Truncilla truncans*)
28. *Truncilla dom*
29. *Leptodea leptisimus*)

In addition th identified:

U. hartmanianus not present in Duck

U. phillipsi Com normal *Obliquaria*

U. nashvillensis likely not found it are missing. It is *mensis* (such as fe

Of the above ence, in Duck F *crassidens*, *Cyp. colata*, *Leptodec lenior*. Since th be mistaken, th be enumerated

Three of the also by Call fe *bema oviforme*, Hinkley & Mar

* Call, R. E. Ge sippi Valley (Bull

from Big Bigby Creek, Maury Co. 5, '52) from Williamsport, Tenn. 1868 (Obs. 12, '69); and *U. vandykei* from "Duck River, Tenn." (*U. clarkiana*) should be compared (as in Call's paper), the locality apparently belonging to the headwaters of the river. Three species stand now as new, *Carmucidina cylindrella*, and *U. vandykei* in Duck River being con-

* published a list of Naiades. Unfortunately, the identifications are so vague it remains doubtful, which number of these shells came from Maury Co., Tenn., and it has been taken for them according to my own collection in Duck River in general. They are according to the modern system

- | | |
|---|---|
| 19. <i>Ptychobranchus fasciolaris</i> (as <i>canachus</i>) | 30. <i>Leptodea fragilis</i> (as <i>gracilis</i>) |
| 20. <i>Ptychobranchus subtentum</i> | 31. <i>Carunculina cylindrella</i> |
| 21. <i>Obliquaria reflexa</i> (as <i>cornutus</i>) | 32. <i>Conradilla caelata</i> |
| 22. <i>Cyprogenia irrorata</i> | 33. <i>Medionidus conradicus</i> |
| 23. <i>Obovaria retusa</i> | 34. <i>Micromya fabalis</i> |
| 24. <i>Obovaria subrotunda</i> (as <i>circulus</i>) | 35. <i>Ligumia recta latissima</i> (as <i>rectus</i>) |
| 25. <i>Actionaias pectorosa</i> (as <i>perdix</i>) | 36. <i>Lampsilis ovata</i> |
| 26. <i>Plagiola lineolata</i> (as <i>securis</i>) | 37. <i>Lampsilis fasciola</i> (as <i>perradiatus</i>) |
| 27. <i>Truncilla truncata</i> (as <i>ele-gans</i>) | 38. <i>Dysnomia triquetra</i> (as <i>triangularis</i>) |
| 28. <i>Truncilla donaciformis</i> | 39. <i>Dysnomia brevidens</i> |
| 29. <i>Leptodea leptodon</i> (as <i>tenuissimus</i>) | 40. <i>Dysnomia lenior</i> |
| | 41. <i>Dysnomia turgidula</i> (as <i>deviatus</i> and <i>turgidulus</i>) |
| | 42. <i>Dysnomia florentina</i> |

In addition the following are in the list, but probably mis-identified:

U. hartmanianus Lea. (*Pleurobema h.*) A Coosa River form, surely not present in Duck River. But it is impossible to say, what it stands for.

U. phillipsi Conrad. A species altogether doubtful; it may be an abnormal *Obliquaria reflexa*.

U. nashvillensis Lea. This is *Ligumia subrostrata*, a species very likely not found in Duck River, since the required ecological conditions are missing. It is possible that gigantic specimens of *Micromya vanuxemensis* (such as found by myself) have been taken for it.

Of the above 42 species I have been able to confirm the existence, in Duck River, of all except the following (7): *Elliptio crassidens*, *Cyprogenia irrorata*, *Obovaria retusa*, *Plagiola lineolata*, *Leptodea leptodon*, *Ligumia recta latissima*, *Dysnomia lenior*. Since they are all rather striking forms, not easily to be mistaken, they should be credited to Duck River, and will be enumerated below.

*Three of the species given by Hinkley and Marsh are given also by Call * for Duck River: *U. clinchensis* (equals) *Pleurobema oviforme*; *U. multiradiatus* (equals) *U. perradiatus* (of Hinkley & Marsh) (equals) *Lampsilis fasciola*; and *U. turgidula*.

* Call, R. E. Geographical Catalogue of the Unionidae of the Mississippi Valley (Bull. Des Moines Acad. Sci. 1. 1885, pp. 1-57.)

11. *Pleurobema cordatum pyramidalatum*
12. *Pleurobema oviforme* (as *clinchensis*, *lesleyi patulus*)
13. *Pleurobema oviforme holstonense* (as *pattinoides*).
14. *Elliptio crassidens* (as *gibber*)
15. *Elliptio dilatatus* (as *gibbosus*)
16. *Lastena lata* (as *dehiscens*)
17. *Lasmigona costata* (as *rugosa*)
18. *Strophitus rugosus* (as *schaffermani*)

* List of Shells Collected in Central Tennessee. This paper has been overlooked by Call in his "Synopsis" (1900). My attention was called to it by C. Goodrich, Toledo, who also kindly

lus (equals) *Dysnomia turg.*; and in subsequent paper*) he adds another one: *U. clavis*, but as will be shown below this is not the real *Pleurobema clava* (Lamarck), but should also be placed with *Pleurobema oviforme* (Conrad).

In the same year (1895), Marshall † gave incidentally a number of records for shells from Duck River (all connected with the name of Hinkley). There are 8 of them: *U. crassidens* (now: *Elliptio cr.*); *U. elegans* (now: *Truncilla truncata*); *U. fabalis*, (now: *Micromya f.*); *M. marginata* (now *Alasmidonta m.*); *U. multiradiatus* (now: *Lampsilis fasciola*); *M. rugosa* (now: *Lasmigona costata*); *U. triangularis* (now: *Dysnomia triquetra*); *U. undulatus* (now: *Amblema costata*). All are found in the list of Hinkley and Marsh, with exception of *Alasmidonta marginata*. It is interesting, that here *Elliptio crassidens* is given by its correct specific name (not as *gibber*).

Among older material, represented in the Carnegie Museum, the following forms from Duck River are found:

- Megaloniais gigantea*, Duck R. (Sterki collection.)
- Cycloniais tuberculata*, Duck R. (Sterki collection.)
- Pleurobema cordatum catillus*, Columbia. (Walker don.)
- Pleurobema cordatum catillus*, Columbia. (Walker don.)
- Actinoniais pectorosa*, Duck R. and Columbia (Hartman collection and Walker don.).
- Conradilla caclata*, Hickman Co. (Hartman collection.)
- Dysnomia triquetra*, Columbia (Clapp don.).
- Dysnomia florentina walkeri*, Duck R. (Sterki collection.)
- Dysnomia capsaeformis*, Columbia (Sterki collection).

Of these, *Pleurobema cordatum* and *cord. catillus*, and *Dysnomia capsaeformis* are new for this system, while *Dysnomia florentina walkeri* undoubtedly corresponds to *D. florentina*.

I visited the river in 1921, 1922, and 1923, and obtained altogether 11 stations for Naiades in the main river, and two

* Call. R. E. A Study of the Unionidae of Arkansas, etc. Trans. Acad. St. Louis 7. 1895, pp. 1-64).

† Marshall, W. B. Geographical Distribution of the New York Unionidae (48. Ann. Rep. N. Y. State Mus. (1894) 1895, pp. 47-99). (in the list of Hinkley and Marsh), and originally was so labelled.

in tributaries. The follow of these localities, with the Duck River, Centreville, H and 4, '21):

Riffles from below R. R. quiet pool above the latter. Water low and clear, s Many dead shells were se water, but living shells wer the appearance as if the N at some time, and that the living shells generally were ta were found), and the n small.

Between Columbia and (the river, are extensive phos very muddy water reaches what injurious substances also iron mines in the vicin normal conditions for Naiad be noted, on the other hand this place was extremely p Naiades ascertained to exist

1. *Megaloniais gigantea*
2. *Amblema costata*
3. *Quadrula pustulosa*
4. *Quadrula quadrula*
5. *Quadrula verrucosa*
6. *Cycloniais tuberculata* (see only).

Only Nos. 1, 2, 3, 5, 11, and Duck River, Ben. Manry Co.,

A small place of this name mile west of the river, near th (on Topogr. Atlas Sheet Colu about 7 miles below Columbia

* Partially reported upon by G 58-59.

(subsequent paper*) he will be shown below this work), but should also be named).

Walker† gave incidentally a list of Naiades from the Duck River (all connected with the main river) 8 of them: *U. crassicornis* (now: *Truncilla truncata*); *M. marginata* (now: *Lampsilis fasciola*); *U. triangularis* (now: *Amblema costata*), and Marsh, with exception of the latter, that here *Elliptio* does not have a specific name (not

found in the Carnegie Museum, but are found:

(Walker collection).
(Walker collection).
(Walker don.).
(Walker don.).
Elliptio (Hartman collection and

(Walker collection).
(Walker don.).

(Walker collection).
(Walker collection).

and *card. catillus*, and *Dysnomia* system, while *Dysnomia* responds to *D. florentina* (Walker, 1894, and 1923, and obtained from the main river, and two

of the Duck River, etc. Trans.

(Walker, 1894) 1895, pp. 47-99).

(Walker, 1894), and originally was so

in tributaries. The following list contains a short description of these localities, with the Naiades found at each of them: *Duck River, Centreville, Hickman Co., Tenn.* (Aug. 29, Sept. 3 and 4, '21):

Riffles from below R. R. bridge to above wagon bridge, and quiet pool above the latter, distance of a little over a mile.

Water low and clear, so that conditions were favorable. Many dead shells were seen on the gravel bars and in the water, but living shells were scarce. Altogether this place had the appearance as if the Naiades had been partially killed off at some time, and that the fauna had not yet recovered. The living shells generally were old (yet a few young *Praptera alata* were found), and the number of species is comparatively small.

Between Columbia and Centreville, chiefly to the south of the river, are extensive phosphate mines, from which, at times, very muddy water reaches the river. But I cannot imagine what injurious substances it contains. There are or were also iron mines in the vicinity. But the fact is evident that normal conditions for Naiad life do not prevail here. It should be noted, on the other hand, that the *Pleurocerid*-fauna * of this place was extremely plentiful and rich in forms. The Naiades ascertained to exist here are the following:

- | | |
|--|---------------------------------------|
| 1. <i>Megaloniais gigantea</i> | 7. <i>Lasmigona complanta</i> |
| 2. <i>Amblema costata</i> | 8. <i>Ptychobrancheus fasciolaris</i> |
| 3. <i>Quadrula pustulosa</i> | 9. <i>Obilquaria reflexa</i> |
| 4. <i>Quadrula quadrula</i> | 10. <i>Truncilla donaciformis</i> |
| 5. <i>Quadrula verrucosa</i> | 11. <i>Leptodea fragilis</i> |
| 6. <i>Cycloniais tuberculata</i> (seen only) | 12. <i>Proptera alata</i> |
| | 13. <i>Lampsilis anodontoides</i> |

Only Nos. 1, 2, 3, 5, 11, and 12 of these were found living. *Duck River, Ben. Maury Co., Tenn.* (Sept. 2, '23):

A small place of this name is located about one and a half mile west of the river, near the lower end of "Alexander Bend" (on Topogr. Atlas Sheet Columbia). Along the river, this is about 7 miles below Columbia.

* Partially reported upon by Goodrich, *Nautilus*, 35, Octob. '21, p. 58-59.

A large gravel bar at the lower end of a quiet pool obstructs the river. At highwater there are two branches, but the smaller (left) does not contain water at low stage. At the time of my visit the water was muddy, so that no living shells could be seen; but they were found in good numbers by feeling for them in the larger (right) branch, where the quiet water of the pool begins to rush down, past the gravel bar. The river apparently was not at the lowest stage, so that specimens (and probably additional species) in the deeper water of the channel (three or more feet) could not be obtained. All forms were alive, except those marked.

- | | |
|---|--|
| 1. <i>Ambiema costata</i> | 11. <i>Lasmigona costata</i> |
| 2. <i>Quadrula pustulosa</i> | 12. <i>Lasmigona complanata</i> |
| 3. <i>Quadrula verrucosa</i> | 13. <i>Strophitus rugosus</i> (dead) |
| 4. <i>Quadrula cylindrica</i> | 14. <i>Ptychobranchus fasciolaris</i> (dead) |
| 5. <i>Cyclonaias tuberculata</i> | 15. <i>Obovaria subrotunda lens</i> |
| 6. <i>Lexingtonia dolabelliformis</i> | 16. <i>Actinonaias carinata</i> |
| 7. <i>Lexingtonia dolabelliformis conradi</i> | 17. <i>Actinonaias pectorosa</i> |
| 8. <i>Pleurobema cordatum catillus</i> | 18. <i>Proptera alata</i> (seen only, dead) |
| 9. <i>Pleurobema oviforme holstonense</i> | 19. <i>Lanysilis ovata</i> |
| 10. <i>Elliptio dilatatus</i> | |

Duck River, Columbia, Maury Co., Tenn. (Aug. 26 and Sept. 1, '21, and Sept. 6, '22):

I collected about two miles below the town of Columbia, immediately above the mouth of Rutherford Creek. By a gravel bar, the river is divided into two branches, above this is a quiet pool. The shells were in the larger, deeper, left branch, in a similar situation to that at Ben. At my three visits, the condition of the river was about the same, with the water at low stage, but somewhat muddy. Many shells, in a few inches of water, were seen, but the majority was found by feeling for them. The locality was not only rich in species, but also in individuals, the latter crowding close together in the gravel. Most of the species were found alive, except those marked.

- | | |
|---------------------------------|--------------------------------------|
| 1. <i>Fusconaias barnesiana</i> | 5. <i>Quadrula verrucosa</i> |
| 2. <i>Megalonaias gigantea</i> | 6. <i>Quadrula intermedia</i> (dead) |
| 3. <i>Ambiema costata</i> | 7. <i>Quadrula cylindrica</i> (dead) |
| 4. <i>Quadrula pustulosa</i> | 8. <i>Cyclonaias tuberculata</i> |

THE NAIAD-FAU

9. *Lexingtonia dolabelliformis*
10. *Lexingtonia dolabelliformis radi*
11. *Pleurobema cordatum*
13. *Pleurobema cordatum midatum*
14. *Pleurobema oviforme*
15. *Pleurobema oviforme holstonense*
16. *Elliptio dilatatus*
17. *Lastena lata*
18. *Lasmigona costata*
19. *Lasmigona complanata*
20. *Alasmidonta marginata* only, dead)
21. *Strophitus rugosus*
22. *Ptychobranchus fasciolaris*

Duck River, four miles
Tenn. (Sept. 5, '22)

This is at the extreme low a covered bridge a water rushes fall-like (ly below, on the left bank numbers of dead shells quiet, forming an eddy found some living shells for them. The water v stage. Most of the shells bar, only *Ambiema costata* found alive.

1. *Megalonaias gigantea*
2. *Ambiema costata*
3. *Quadrula pustulosa*
4. *Quadrula fragosa*
5. *Quadrula verrucosa*
6. *Cyclonaias tuberculata*
7. *Elliptio dilatatus* (seen)
8. *Lasmigona costata*
9. *Lasmigona complanata*

Duck River, Leftwich, M
Below Leftwich Bridge
dividing the river into

ed of a quiet pool obstructs
 two branches, but the small
 low stage. At the time
 that no living shells could
 be found by feeling for
 numbers by feeling for
 where the quiet water of
 the gravel bar. The river
 is so deep, so that specimens (and
 deeper water of the channel
 obtained. All forms were

- Lasmigona costata*
- Lasmigona complanata*
- Strophitus rugosus* (dead)
- Ptychobranchnus fasciolare*
(dead)
- Obovaria subrotunda lens*
- Actinonaias carinata*
- Actinonaias pectorosa*
- Proptera alata* (seen only,
dead)
- Lampsilis ovata*

, Tenn. (Aug. 26 and Sept.

near the town of Columbia, in
 Herford Creek. By a gravel
 bar, above this is a quiet
 deeper, deeper, left branch, in

At my three visits, the con-
 came, with the water at low
 any shells, in a few inches of
 it was found by feeling for
 y rich in species, but also in
 close together in the gravel.
 live, except those marked.

- 5. *Quadrula verrucosa*
- 6. *Quadrula intermedia* (dead)
- 7. *Quadrula cylindrica* (dead)
- 8. *Cyclonaias tuberculata*

THE NAIAD-FAUNA OF DUCK RIVER IN TENNESSEE. 25

- | | |
|--|--|
| 9. <i>Lexingtonia dolabelloides</i> | 23. <i>Ptychobranchnus subtentum</i> |
| 10. <i>Lexingtonia dolabelloides con-</i>
<i>radi</i> | 24. <i>Obovaria subrotunda</i> |
| 11. <i>Pleurobema cordatum</i> | 25. <i>Obovaria subrotunda lens</i> |
| 13. <i>Pleurobema cordatum pyra-</i>
<i>midatum</i> | 26. <i>Actinonaias carinata</i> |
| 14. <i>Pleurobema oviforme</i> | 27. <i>Actinonaias pectorosa</i> |
| 15. <i>Pleurobema oviforme holsto-</i>
<i>nense</i> | 28. <i>Truncilla truncata</i> |
| 16. <i>Elliptio dilatatus</i> | 29. <i>Leptodea fragillis</i> |
| 17. <i>Lastena lula</i> | 30. <i>Proptera alata</i> (seen only,
dead) |
| 18. <i>Lasmigona costata</i> | 31. <i>Conradilla caelata</i> |
| 19. <i>Lasmigona complanata</i> | 32. <i>Medionidus conradicus</i> (dead) |
| 20. <i>Alasmidonta marginata</i> (seen
only, dead) | 33. <i>Lampsilis ovata</i> |
| 21. <i>Strophitus rugosus</i> | 34. <i>Lampsilis ovata ventricosa</i> |
| 22. <i>Ptychobranchnus fasciolare</i> | 35. <i>Lampsilis fasciola</i> |
| | CF. <i>Dysnomia triquetra</i> |
| | 37. <i>Dysnomia brevidens</i> |
| | 38. <i>Dysnomia capsaeformis</i> |

*Duck River, four miles east of and above Columbia, Maury Co.,
 Tenn. (Sept. 5, '22) :*

This is at the extremity of a big meander of the river, be-
 low a covered bridge and an old dam, gone into decay. The
 water rushes fall-like through a gap in the dam. Immediately
 below, on the left bank, is a large gravel bar, covered with
 numbers of dead shells. Below this bar the water is more
 quiet, forming an eddy with mud-covered gravel. Here I
 found some living shells, in a depth of 2 to 3 feet, by feeling
 for them. The water was rather muddy, but near low-water
 stage. Most of the shells were gathered dead from the gravel
 bar, only *Amblema costata* and *Cyclonaias tuberculata* were
 found alive.

- | | |
|--|--|
| 1. <i>Megalonaias giguntea</i> | 10. <i>Alasmidonta marginata</i> |
| 2. <i>Amblema costata</i> | 11. <i>Ptychobranchnus fasciolare</i> |
| 3. <i>Quadrula pustulosa</i> | 12. <i>Obovaria subrotunda lens</i>
(seen only) |
| 4. <i>Quadrula fragosa</i> | 13. <i>Actinonaias pectorosa</i> |
| 5. <i>Quadrula verrucosa</i> | 14. <i>Lampsilis ovata ventricosa</i> |
| 6. <i>Cyclonaias tuberculata</i> | 15. <i>Dysnomia triquetra</i> (seen
only) |
| 7. <i>Elliptio dilatatus</i> (seen only) | |
| 8. <i>Lasmigona costata</i> | |
| 9. <i>Lasmigona complanata</i> | |

Duck River, Leftwich, Maury Co., Tenn. (Sept. 3, '23) :

Below Leftwich Bridge is a bush-covered island or islands,
 dividing the river into several branches. I selected the left

one, which is narrow, rocky and gravelly, rather deep in places, but with a number of shallower riffles. The stage of the water was fairly low, but the water was muddy, just beginning to clear. No shells were found by sight, all by feeling, mostly in a swiftly flowing portion in one to two feet of water, on gravelly bottom. All were alive.

- | | |
|---|-------------------------------------|
| 1. <i>Amblema costata</i> | 9. <i>Lasmigona costata</i> |
| 2. <i>Quadrula pustulosa</i> | 10. <i>Alasmidonta marginata</i> |
| 3. <i>Quadrula verrucosa</i> | 11. <i>Ptychobranchus subtentum</i> |
| 4. <i>Cyclonaias tuberculata</i> | 12. <i>Obovaria subrotunda lens</i> |
| 5. <i>Lexingtonia dolabelloides conradi</i> | 14. <i>Conradilla caelata</i> |
| 6. <i>Pleurobema cordatum catillus</i> | 15. <i>Medionidus conradicus</i> |
| 7. <i>Pleurobema cordatum pyramidatum</i> | 16. <i>Lampsilis ovata</i> |
| 8. <i>Elliptio dilatatus</i> | 17. <i>Lampsilis fasciola</i> |
| | 18. <i>Dysnomia triquetra</i> |
| | 19. <i>Dysnomia capsaeformis</i> |

Duck River, Lillard's Mills, Marshall Co., Tenn. (Aug. 25, '23) :

This is below an old dam. The river is broad, forming a ford. The water was beginning to clear, and was nearly at low-stage. For about two-thirds of the width of the river (from left bank), the water was very shallow, and some living shells were visible here. A gradually deepening channel was close to the right bank, in part densely overgrown with water weeds. Among these weed patches, on gravelly-sandy bottom, the majority of the Naiades was found by feeling for them. Current lively, in part strong. All species were found alive.

- | | |
|---|--|
| 1. <i>Amblema costata</i> | 10. <i>Lasmigona costata</i> |
| 2. <i>Quadrula fragosa</i> | 11. <i>Alasmidonta marginata</i> |
| 3. <i>Quadrula verrucosa</i> | 12. <i>Strophitus rugosus</i> |
| 3. <i>Quadrula cylindrica</i> | 13. <i>Obovaria subrotunda lens</i> |
| 5. <i>Cyclonaias tuberculata</i> | 14. <i>Actionaias pectorosa</i> |
| 6. <i>Lexingtonia dolabelloides conradi</i> | 15. <i>Leptodea fragilis</i> |
| 7. <i>Pleurobema cordatum pyramidatum</i> | 16. <i>Medionidus conradicus</i> |
| 8. <i>Pleurobema oviforme</i> | 17. <i>Lampsilis ovata ventricosa</i> |
| 9. <i>Elliptio dilatatus</i> | 18. <i>Lampsilis fasciola</i> |
| | 19. <i>Dysnomia florentina walkeri</i> |
| | 20. <i>Dysnomia capsaeformis</i> |

Duck River, Wilhoite, Marshall Co., Tenn. (Aug. 27, '23) :

Similar to the preceding place, below a dam. Water strongly, but irregularly, flowing, the shallower part on the right

bank, the deeper channel on the left. Conditions most favorable, water was to a depth of about eight to ten feet. It had been low water, since many shells were found in a few inches of water. All

1. *Fusconaia barnesiana*
2. *Fusconaia barnesiana bigbyensis*
3. *Amblema costata*
4. *Quadrula fragosa*
5. *Quadrula verrucosa*
6. *Quadrula cylindrica*
7. *Cyclonaias tuberculata*
8. *Lexingtonia dolabelloides conradi*
9. *Pleurobema cordatum catillus*
10. *Pleurobema cordatum pyramidatum*
11. *Pleurobema oviforme*
12. *Pleurobema oviforme argenteum*

Duck River, Shelbyville, Beatty, Tenn. (Aug. 3, '22) :

Also below a dam. River divided into two channels. In one of them, in and below the dam, on gravel and mud, the majority of the Naiades was found by sight, in part by feeling to a depth of about a foot, and in part by feeling to a depth of about a foot, and all found alive, with one exception.

1. *Fusconaia barnesiana*
2. *Fusconaia barnesiana bigbyensis*
3. *Amblema costata*
4. *Quadrula verrucosa*
5. *Cyclonaias tuberculata* (dead)
6. *Lasmigona costata*
7. *Anodonta grandis*
8. *Alasmidonta minor*
9. *Alasmidonta marginata*

Duck River, Normandy, Bedford Co., Tenn. (Aug. 27, '23) :

A gravel bar, forcing the

velly, rather deep in places, ... The stage of the water ... muddy, just beginning to ... light, all by feeling, mostly in ... two feet of water, on grav-

bank, the deeper channel on the left. Plenty of water weeds. Conditions most favorable, water clear enough to see shells up to a depth of about eight to ten inches. The stage must have been low water, since many shells were found close to banks in a few inches of water. All species found alive.

- 1. *Lasmigona costata*
- 2. *Alasmidonta marginata*
- 3. *Ptychobranchus subtentum*
- 4. *Obovaria subrotunda lens*
- 5. *Conradilla caelata*
- 6. *Medionidus conradicus*
- 7. *Lampsilis ovata*
- 8. *Lampsilis fasciola*
- 9. *Dysnomia triquetra*
- 10. *Dysnomia capsaeformis*

- 1. *Fusconaia barnesiana*
- 2. *Fusconaia barnesiana bigbyensis*
- 3. *Amblema costata*
- 4. *Quadrula fragosa*
- 5. *Quadrula verrucosa*
- 6. *Quadrula cylindrica*
- 7. *Cyclonaias tuberculata*
- 8. *Lexingtonia dolabelloides conradi*
- 9. *Pleurobema cordatum catillus*
- 10. *Pleurobema cordatum pyramidatum*
- 11. *Pleurobema oviforme*
- 12. *Pleurobema oviforme argenteum*
- 13. *Elliptio dilatatus*
- 14. *Lasmigona costata*
- 15. *Strophitus rugosus*
- 16. *Obovaria subrotunda*
- 17. *Obovaria subrotunda lens*
- 18. *Carunculina moesta*
- 19. *Medionidus conradicus*
- 20. *Micromya fabalis*
- 21. *Lampsilis ovata*
- 22. *Lampsilis ovata ventricosa*
- 23. *Lampsilis fasciola*
- 24. *Dysnomia triquetra*
- 25. *Dysnomia brevidens*
- 26. *Dysnomia florentina walkeri*
- 27. *Dysnomia capsaeformis*

Bedford Co., Tenn. (Aug. 25, '23) :

river is broad, forming a ... clear, and was nearly at ... the width of the river (from ... shallow, and some living shells ... deepening channel was close ... overgrown with water weeds. ... gravelly-sandy bottom, the ma- ... by feeling for them. Current ... were found alive.

Duck River, Shelbyville, Bedford Co., Tenn. (Sept. 1 and 3, '22) :

Also below a dam. River divided into a number of branches. In one of them, in and below a small riffle, in an eddy, with gravel and mud, the majority of the Naiades was found, in part by sight, in part by feeling for them. Water clear to a depth of about a foot, and apparently at low stage. Shells all found alive, with one exception, so marked.

- 10. *Lasmigona costata*
- 11. *Alasmidonta marginata*
- 12. *Strophitus rugosus*
- 13. *Obovaria subrotunda lens*
- 14. *Actionaias pectorosa*
- 15. *Leptodea fragilis*
- 16. *Medionidus conradicus*
- 17. *Lampsilis ovata ventricosa*
- 18. *Lampsilis fasciola*
- 19. *Dysnomia florentina walkeri*
- 20. *Dysnomia capsaeformis*

- 1. *Fusconaia barnesiana*
- 2. *Fusconaia barnesiana bigbyensis*
- 3. *Amblema costata*
- 4. *Quadrula verrucosa*
- 5. *Cyclonaias tuberculata* (dead)
- 6. *Lasmigona costata*
- 7. *Anodonta grandis*
- 8. *Alasmidonta minor*
- 9. *Alasmidonta marginata*
- 10. *Strophitus rugosus*
- 11. *Obovaria subrotunda lens*
- 12. *Carunculina moesta*
- 13. *Medionidus conradicus*
- 14. *Micromya tueniata*
- 15. *Micromya vanuxemensis*
- 16. *Lampsilis ovata ventricosa*
- 17. *Dysnomia triquetra*
- 18. *Dysnomia turgidula*

Bedford Co., Tenn. (Aug. 27, '23) :

below a dam. Water strong- ... shallower part on the right

Duck River, Normandy, Bedford Co., Tenn. (Aug. 22, '23) :

A gravel bar, forcing the river to one (left) side. Water

strongly flowing, not very clear. Shells found by feeling, in gravel, and not very abundant. All alive.

- | | |
|---|-----------------------------------|
| 1. <i>Fusconaia barnesiana</i> | 5. <i>Ptychobranhus subtentum</i> |
| 2. <i>Fusconaia barnesiana bigbyensis</i> | 6. <i>Medionidus conradicus</i> |
| 3. <i>Alasmidonta minor</i> | 7. <i>Micromya taeniata</i> |
| 4. <i>Strophitus rugosus</i> | 8. <i>Micromya vanuxemensis</i> |

Duck River, Coffee Co., Tenn. (Aug. 22, '23):

This is three miles east of Normandy. A ford, the river divided into several strongly flowing branches. Water not very clear. In a quiet eddy, in mud, a number of living specimens of *Carunculina cylindrella* were found. At another place, in a very small, strongly flowing connecting branch between two larger branches, two living specimens of *Lexingtonia dolabelloides conradi* were secured, both apparently washed out of deeper water.

Duck River, Manchester, Coffee Co., Tenn. (Aug. 21, '23):

Below bridge, northwest of town. Water, crystal-clear (a dam some distance above), flowing over solid bed-rock (honey-combed limestone). Under overhanging ledges of rock, in sand and mud, about half a dozen *Lasmigona holstonia* were found.

Buffalo River, Riverside, Lewis Co., Tenn. (Sept. 7, '22):

Close to, and below R. R. station. River only of creek-size, full of riffles and more quietly flowing water; water clear. Naiades abundant everywhere, on gravelly, sandy, and muddy bottom. All species found alive.

- | | |
|---|---------------------------------------|
| 1. <i>Fusconaia barnesiana</i> | 9. <i>Strophitus rugosus</i> |
| 2. <i>Fusconaia barnesiana bigbyensis</i> | 10. <i>Ptychobranhus subtentum</i> |
| 3. <i>Lexingtonia dolabelloides conradi</i> | 11. <i>Obovaria subrotunda lens</i> |
| 4. <i>Pleurobema oviforme</i> | 12. <i>Actionaias pectorosa</i> |
| 5. <i>Pleurobema oviforme argenteum</i> | 13. <i>Carunculina cylindrella</i> |
| 6. <i>Lasmigona costata</i> | 14. <i>Micromya nebulosa</i> |
| 7. <i>Alasmidonta minor</i> | 15. <i>Micromya taeniata</i> |
| 8. <i>Alasmidonta marginata</i> | 16. <i>Micromya vanuxemensis</i> |
| | 17. <i>Lampsilis ovata ventricosa</i> |
| | 18. <i>Lampsilis fasciola</i> |

Garrison Creek, Wa

From R. R. bridge
Creek small, everyw
tions of current, bo
a riffle in very shall
not plentiful, but w
except the one not t

1. *Fusconaia barnesiana*
2. *Fusconaia barnesiana*
3. *Lasmigona costata*
4. *Strophitus rugosus*

ENUMERATION OF FO

1. *Fusconaia barnesiana*

Duck R., Columbia
R., Riverside; Gar
from Columbia (as I
Marsh).

A Cumberlandian
pi and Ohio.)

Cumberland River
type-locality, but it h
Wilson & Clark (18
(i. e. p. 57), if corre
cens (large-river-for
Fork Cumberland, a
Marsh from Nashvill
the Tennessee drainag
ers of medium size.

Of this form of th
specimens have been
of them (a female fr
it demonstrates the i
with this. It is alm

* With regard to syno
E. and Walker, B. Occas.

Shells found by feeling, in
All alive.

5. *Ptychobranchus subtentum*
6. *Medionidus conradicus*
7. *Micromya taeniata*
8. *Micromya vanuxemensis*

(Aug. 22, '23) :

Normandy. A ford, the river di-
ving branches. Water not very
a number of living specimens
found. At another place, in
connecting branch between two
specimens of *Lexingtonia dolabel-*
both apparently washed out of

Co., Tenn. (Aug. 21, '23) :

town. Water, crystal-clear (a
ing over solid bed-rock (honey-
overhanging ledges of rock, in
open *Lasmigona holstonia* were

Co., Tenn. (Sept. 7, '22) :

ation. River only of creek-size,
by flowing water; water clear.
on gravelly, sandy, and muddy
etc.

9. *Strophitus rugosus*
10. *Ptychobranchus subtentum*
11. *Obovaria subrotunda lens*
12. *Actionulias pectorosa*
13. *Carunculina cylindrella*
14. *Micromya nebulosa*
15. *Micromya taeniata*
16. *Micromya vanuxemensis*
17. *Lampsilis ovata ventricosa*
18. *Lampsilis fasciola*

Garrison Creek, Wartrace, Bedford Co., Tenn. (Sept. 2, '22) :

From R. R. bridge, south of town, one to two miles upward.
Creek small, everywhere fordable, with great variety of condi-
tions of current, bottom, etc. Shells chiefly at one place, in
a riffle in very shallow water (a few inches deep), in gravel,
not plentiful, but well visible in the clear water. All alive,
except the one not taken.

- | | |
|---|---|
| 1. <i>Fusconaia barnesiana</i> | 5. <i>Medionidus conradicus</i> |
| 2. <i>Fusconaia barnesiana bigby-</i>
<i>ensis</i> | 6. <i>Micromya vanuxemensis</i> |
| 3. <i>Lasmigona costata</i> | 7. <i>Lampsilis ovata ventricosa</i>
(seen only, dead) |
| 4. <i>Strophitus rugosus</i> | 8. <i>Lampsilis fasciola</i> |

ENUMERATION OF FORMS WITH TAXONOMIC AND GEOGRAPHICAL
REMARKS. *

1. *Fusconaia barnesiana* (Lea).

Duck R., Columbia, Wilhoite, Shelbyville, Normandy; Buffa-
lo R., Riverside; Garrison Cr., Wartrace.—Previously reported
from Columbia (as *U. validus* and *barnesianus*) (Hinkley and
Marsh).

A Cumberlandian type, not in the interior basin (Mississip-
pi and Ohio.)

Cumberland River, Tenn. (without exact locality) is the
type-locality, but it has not been found nor been mentioned by
Wilson & Clark (1914), but probably *Pleurobema crudum*
(i. e. p. 57), if correctly identified, stands for the var. *tumes-*
cens (large-river-form). The latter form is known from South
Fork Cumberland, and also has been given by Hinkley and
Marsh from Nashville. *F. barnesiana* is widely distributed in
the Tennessee drainage, below and above Walden Gorge, in riv-
ers of medium size.

Of this form of the medium rivers only comparatively few
specimens have been found by myself in Duck River, yet one
of them (a female from Columbia) is very interesting, because
it demonstrates the identity of *U. validus* Lea (Duck River)
with this. It is almost a counterpart of Lea's figure, only

* With regard to synonymy and nomenclature, compare: Ortmann, A.
E. and Walker, B. Occas. Pap. Mus. Mich. 112, 1922.

slightly larger. Its diameter is 47% of the length, the same as that given by Simpson ('14 p. 750), while Lea's figure would give 49%. *U. validus* ('71) is thus an additional synonym to *U. barnesianus* ('38) and corresponds most closely to *U. lyoni* Lea ('65).

2. *Fusconaia barnesiana bigbyensis* (Lea).

Duck R., Wilhoite, Shelbyville, Normandy; Buffalo R., Riverside; Garrison Cr., Wartrace.—Type locality: Big Bigby Creek (Lea).

At the localities where I found this form, it is the prevailing one, and it is not rare. The measurements confirm my view, * that this is the compressed headwaters form of *F. barnesiana*. Also the larger size attained by *bigbyensis* is seen in specimens from Wartrace.

This flat form has not been reported from the Cumberland, but it is found abundantly in small streams of the lower and upper Tennessee region, going up into Virginia. My identification of the upper Tennessee specimens as *bigbyensis* is thus fully justified.

The large-river-form, *F. barnesiana tumesens*, has not been found in Duck River, but it is in the Cumberland (as *crudus*), and in the Tennessee from the Mussel Shoals to the Knoxville region.

3. *Megaloniaias gigantea* (Barnes).

Duck River, Centreville, Columbia, above Columbia.—Scarce.—Reported from Columbia by Hinkley and Marsh.

In the Cumberland in the lower part up to Wayne County, Ky. At the Mussel Shoals of the Tennessee in northern Alabama; absent in the upper Tennessee. Widely distributed in the larger rivers of the interior basin (Mississippi, Ohio, etc.).

4. *Amblyma costata* Rafinesque.

Duck R., Centreville, Ben, Columbia, above Columbia, Leftwich, Lillard's Mills, Wilhoite, Shelbyville.—Known from Columbia (Hinkley and Marsh, Marshall).

Widely distributed in the Cumberland and its tributaries (reported by Wilson and Clark from Cumberland proper as

Quadrula perplicata,
Qu. undulata (equi-
tributaries below an
ing way up into the

Common in the
sented there, in the
ta and *peruviana*.

5. *Quadrula pustulata*

Duck R., Centreville,
wich.—Known from
to the lower and mid-
bia plentiful.

Abundant in the in-
falls; below Walder
parts of some tributaries
Knoxville region.

6. *Quadrula quadrata*

Duck River, Centreville,
many dead shells were

This species is common
basin, but has not been
son and Clark, and is
Mussel Shoals upwar-
land and at the Mussel
species). My specimens
gosa, of considerable
the nodules only more
epidermis typical.

7. *Quadrula fragosa*

Duck R., above Columbia,
ported from Columbia
specimens taken by n-

Wilson and Clark
Wilson Co., Tenn., at
Mussel Shoals of the
seum, collected by H.
quadrula, in the upper

47% of the length, the same (p. 750), while Lea's figure (p. 750) is thus an additional synonym. It corresponds most closely to *Quadrula perplicata* (Lea).

Normandy; Buffalo R., River. Type locality: Big Bigby.

In this form, it is the prevailing form. Measurements confirm my view, that the form of *F. barnesiana*. *Bigbyensis* is seen in specimens

reported from the Cumberland, small streams of the lower and upper part up into Virginia. My identification of specimens as *bigbyensis* is thus

barnesiana tumescens, has not been reported from the Cumberland (as *crudus*), from the Mussel Shoals to the Knoxville (as *barnes*).

Columbia, above Columbia.—Reported from Columbia by Hinkley and Marsh. Lower part up to Wayne County, Tennessee in northern Alabama and Tennessee. Widely distributed in the interior basin (Mississippi, Ohio, etc.).

Columbia, above Columbia, Left-wich, Shelbyville.—Known from Columbia by Hinkley and Marsh.

Cumberland and its tributaries. Reported from Cumberland proper as

Quadrula perplicata, passing in the upstream direction into *Qu. undulata* (equals) *A. costata*). In the Tennessee and its tributaries below and above Walden Gorge also abundant, going way up into the Clinch, Holston, French, Broad, etc.

Common in the Mississippi and Ohio drainages, but represented there, in the largest rivers, by forms called *A. perplicata* and *peruviana*.

5. *Quadrula pustulosa* (Lea).

Duck R., Centreville, Ben, Columbia, above Columbia, Left-wich.—Known from Columbia (Hinkley & Marsh).—Belongs to the lower and middle part of the river, not rare, at Columbia plentiful.

Abundant in the interior basin. In the Cumberland up to the falls; below Walden Gorge in Tennessee proper and lower parts of some tributaries; in the upper Tennessee up to the Knoxville region.

6. *Quadrula quadrula* (Rafinesque).

Duck River, Centreville, apparently not rare, since a good many dead shells were seen.—*New to the Duck River fauna*.

This species is common in the larger rivers of the interior basin, but has not been reported from the Cumberland by Wilson and Clark, and is not known from the Tennessee from the Mussel Shoals upward, but it is represented in the Cumberland and at the Mussel Shoals by *Qu. fragosa* (see next species). My specimens from Centreville are this, and not *fragosa*, of considerable size, with more or less transverse shape, the nodules only moderately developed, and the color of the epidermis typical.

7. *Quadrula fragosa* (Conrad).

Duck R., above Columbia, Lillard's Mills, Wilhoite.—Reported from Columbia (Hinkley and Marsh).—Only a few specimens taken by myself.

Wilson and Clark give this for Cumberland River, up to Wilson Co., Tenn., and from lower Harpeth river. At the Mussel Shoals of the Tennessee (specimens in Carnegie Museum, collected by H. H. Smith). Missing, as well as *Qu. quadrula*, in the upper Tennessee. The Carnegie Museum pos-

sesses a single specimen from the Cumberland at Nashville, confirming the record of Wilson and Clark. It has been reported from a number of places in the interior basin, but its geographical relation to *Qu. quadrula* is not clear. The fact of its occurrence in central Tennessee and northern Alabama might indicate that it is the upstream representative of *Qu. quadrula*, and this surely is the case in Duck River.

This species is hard to distinguish from *Qu. quadrula*, as admitted by Simpson ('14 p. 844). It differs by the more rounded-quadrate (not transverse) outline, with the nodules of the surface more strongly developed, and the brown, rayless epidermis. Yet there are specimens, which connect the two, but I have not found any intergrades in Duck River, where this species is found distinctly farther upstream than *Qu. quadrula*.

8. *Quadrula verrucosa* (Rafinesque).

Duck R., Centreville, Ben, Columbia, above Columbia, Leftwich, Lillard's Mills, Wilhoite, Shelbyville.—Reported from Columbia by Hinkley and Marsh.—Fairly abundant all along the river.

Widely distributed in the interior basin (and elsewhere). In Cumberland R., up to the falls, and also in some tributaries; common in the lower Tennessee and most of its tributaries. In the upper Tennessee known only from Hiwassee River, and missing in the Knoxville region and above.

9. *Quadrula intermedia* (Conrad).

Duck R., Columbia.—Given from the same place by Hinkley and Marsh.—I found only a single dead shell.

A Cumberland type, not found in the interior basin.

Rare in the upper Cumberland (reported as *Qu. tuberosa*). In the Tennessee at the Mussel Shoals and at Bridgeport, Ala., in the upper Tennessee chiefly toward the headwaters, and rare.

10. *Quadrula cylindrica* (Say).

Duck R., Ben, Columbia, Lillard's Mills, Wilhoite.—Reported from Columbia by Hinkley and Marsh.—Only a few specimens found by myself at each place. All over the interior re-

gion (and also Rivers, up to

11. *Cyclonema*

Duck R., Centreville, Lillard's Mills, Columbia by abundant.

All over the land, lower and avoiding only

12. *Leringia*

Duck R., Ben Hinkley and

A Cumberland the Mussel Shoals missing in the *subglobatus* L. Nashville, Tenn. frequently, and in a form of large by the next fe

13. *Leringia*

Duck R., Ben Coffee Co.; Ben

dian type, not the lower and and headwater

The gradually shown certain proportions (diameter 50% pressed form. Wilhoite, in Coffee diameter falls

the Cumberland at Nashville, and Clark. It has been reported in the interior basin, but its distribution is not clear. The fact of its occurrence in Tennessee and northern Alabama is a stream representative of *Quadrula* in Duck River.

It differs from *Quadrula quadrula*, as follows: (1) It differs by the more rounded outline, with the nodules well developed, and the brown, ray-like specimens, which connect the specimens intergrades in Duck River, and is found farther upstream than

(2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)

Columbia, above Columbia, Leftwich, Lillard's Mills, Wilhoite, Shelbyville.—Reported from the latter place by Hinkley and Marsh.—Fairly abundant all along

the interior basin (and elsewhere). In the lower and also in some tributaries; it is found in the lower and most of its tributaries. It is known only from Hiwassee in the lower region and above.

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)

Reported from the same place by Hinkley and Marsh.—Single dead shell.

It is found in the interior basin.

It is reported as *Quadrula tuberosa*. It is found at Shoals and at Bridgeport, Ala., and is found toward the headwaters, and

Reported from Lillard's Mills, Wilhoite.—Reported from the latter place by Hinkley and Marsh.—Only a few specimens. All over the interior re-

gion (and elsewhere). Also in Cumberland and Tennessee Rivers, up to Virginia, in larger and smaller streams.

11. *Cyclonaias tuberculata* (Rafinesque).

Duck R., Centreville, Ben, Columbia, above Columbia, Leftwich, Lillard's Mills, Wilhoite, Shelbyville.—Reported from the latter place by Hinkley and Marsh.—At most places quite abundant.

All over the interior basin, and abundant in the Cumberland, lower and upper Tennessee, in larger and smaller rivers, avoiding only the headwaters.

12. *Lexingtonia dolabelloides* (Lea).

Duck R., Ben, Columbia.—Reported from the latter place by Hinkley and Marsh (as *U. circumactus*), and abundant.

A Cumberland type, but peculiar to the Tennessee R., from the Mussel Shoals upward to the Knoxville region. Apparently missing in the Cumberland, although one of the synonyms (*U. subglobatus* Lea) has been given for (Florence, Ala., and) Nashville, Tenn. But it has never been found there subsequently, and is missing in the list of Wilson and Clark. It is a form of larger rivers, and represented, in the smaller ones, by the next form, and this holds good also for Duck River.

13. *Lexingtonia dolabelloides conradi* (Vanatta).

Duck R., Ben, Columbia, Leftwich, Lillard's Mills, Wilhoite, Coffee Co.; Buffalo R., Riverside.—*New for Duck River system.*

Distribution similar to the preceding form. A Cumberlandian type, not reported from the Cumberland, but abundant in the lower and upper Tennessee, chiefly in the smaller streams and headwaters.

The gradual transition of *dolabelloides* into *conradi* is beautifully shown in Duck River. While at Ben and Columbia a certain proportion of the specimens falls under *dolabelloides* (diameter 50% of length or more), farther up only the compressed form (*conradi*) occurs (dia. less than 50%). At Wilhoite, in Coffee County, and in Buffalo River (Riverside) the diameter falls as low as 41 and 40%.

14. *Pleurobema cordatum* (Rafinesque).

Duck R., Columbia, rare.—*New to Duck River.*

Abundant in the Cumberland, and in the Tennessee up to the Knoxville region, generally associated with several of its varieties. Also abundant in the interior basin, chiefly in the Ohio, and preferring larger rivers.

The typical *cordatum* is in Duck River, but apparently rare; a fine, large specimen from the Sterki collection (in Carn. Mus.), without exact locality, is this, and I have found several at Columbia, which should be placed here, which are more or less typical, some of them, however, inclining by shallow radial furrow toward var. *catillus*, or by reddish nacre toward var. *pyramidatum*. The usual forms, in which the *cordatum*-group turns up in Duck River are the next two.

15. *Pleurobema cordatum catillus* (Conrad):

Duck R., Ben, Columbia, Leftwich, Wilhoite.—*New to Duck River.*

Distribution similar to that of the main species, and generally found associated with it. (However, west of the Mississippi it exists without *cordatum*).

This is decidedly more abundant in Duck River than the true *cordatum*, but it inosculates closely with the typical form, and also with the var. *pyramidatum*, having often reddish nacre.

Note: The *coccineum*-form of the *cordatum*-type, found occasionally in the Cumberland and Tennessee towards the headwaters, being merely a flattened *catillus*, has not been observed in Duck River.

16. *Pleurobema cordatum pyramidatum* (Lea).

Duck R., Columbia, Leftwich, Lillard's Mills, Wilhoite.—Given from Columbia by Hinkley and Marsh.

Distribution similar to that of the two preceding forms, and generally associated with them, but going a little farther upstream.

This is the most abundant form of the *cordatum*-group in Duck River, outnumbering the other two forms chiefly at the upper stations. The *pyramidatum*-type, however, is not well developed here, the shells being not extremely oblique, and

passing, in the mostly red. I and specimen thus into *cati*

17. *Pleurobi*

Duck River Riverside.—E (as: *elichen* by Call (as r

A *Cumberl*

From Cur

Pl. clara has

ation is cor

specimens of

form is pres

Smith collect

from Sequa

sure that his

I collected n

freeseboro.

upper Ten

uted, chiefly

Pl. clara

the latter m

case in Cal

figures this

able to cont

typical *ovif*

and the cor

shell, and th

furrow in c

the front p

Wilhoite, w

* It is very tification, in approach it but his text But it sh

passing, in this character, into typical *cordatum*. The naere is mostly red. The radial furrow is sometimes poorly developed, and specimens, which at the same time are little oblique, pass thus into *catillus*.

17. *Pleurobema oviforme* (Conrad).

Duck River, Columbia, Lillard's Mills, Wilhoite; Buffalo R., Riverside.—Reported from Columbia by Hinkley and Marsh (as: *clinchensis*, *tesleyi*, and *patulus*) * and from Duck River by Call (as *clinchensis* and *clavus*).

A Cumberland type.

From Cumberland River (South Fork and Rockcastle R.), *Pl. clava* has been reported by Wilson and Clark (if identification is correct), and the Carnegie Museum possesses two specimens of *clava*, labeled: Cumberland R., Tenn. The same form is present from the Mussel Shoals (Tuscumbia) from the Smith collection. I have seen it also in the Walker collection from Sequatchie R., Jasper, Marion County, Tenn. But it is sure that also *Pl. oviforme* is in the Cumberland drainage, for I collected myself a fine set of it in W. Fk. Stones R., Murfreesboro, Rutherford Co., Tenn. In the lower and upper Tennessee drainage *oviforme* is widely distributed, chiefly in the tributaries.

Pl. clava (Lamarck) is very closely allied to *oviforme*, and the latter may be easily mistaken for the former. This is the case in Call's report of *clava* from Duck River. Since he figures this form (the figure probably is enlarged), we are able to control the identification, and pronounce it a rather typical *oviforme*. The beaks are less anterior than in *clava*, and the contrast between the anterior, swollen part of the shell, and the compressed posterior (producing a kind of radial furrow in *clava*) is not seen: the shell tapers gradually from the front part towards the end. I have specimens from Wilhoite, which entirely correspond to Call's figure, and even

* It is very doubtful, whether these names all rest upon correct identification, in view of their close resemblance to *Lexingtonia*-forms. I approach it in size (L. 68 mm. Call's figure is 80 mm long, but his text gives 53 mm).

But it should not be forgotten that specimens of *clava* in

the upper Ohio drainage sometimes approach the *ovidforme*-type, chiefly in young shells, and it might be possible that somewhere the two supposed species actually intergrade.

18. *Pleurobema oviforme argenteum* (Lea).

Duck R., Wilhoite; Buffalo R., Riverside.—*New for this drainage*.—A few only at the first place, abundant at the latter.

Also restricted to the Cumberland region.

This headwaters-form has not been reported from the Cumberland, but it may be present there. In the tributaries and the headwaters of the lower and upper Tennessee it is abundant.

Also in Duck River it is only in the headwaters, yet associated with typical *oviforme*, and passing into it. I have not seen here the specimens of great size, frequently observed in the Tennessee drainage.

19. *Pleurobema oviforme holstonense* (Lea).

Duck R., Ben, Columbia.—Reported from Columbia by Hinkley and Marsh (as *pattinoides*).—I found only a few specimens.

Also a Cumberland type.

Not reported from Cumberland system, but known from the Tennessee proper, and the lower parts of some of its tributaries, from the Mussel Shoals up to the Knoxville region.

Thus also in Duck River the law holds good, that this form represents the large-river-form of *oviforme*; at Columbia the two forms intergrade.

20. *Elliptio crassidens* (Lamarck).

Reported by Hinkley and Marsh (as *gibber*) from Columbia, and by Marshall (as *crassidens*) from Duck River. I did not find it, and no trace of it was seen among the thousands of dead shells lying on the gravel bars. Thus it must be rare, and possibly it belongs to the lower parts of the river. But I do not hesitate to admit it to the list, since it is impossible to mistake this species.

Abundant in the larger rivers of the interior basin, chiefly the Ohio drainage. In the Cumberland it goes up to the falls, and is also in the lower part of some of the tributaries. In

the Tennessee it is even above, avoiding only the

21. *Elliptio dilatatus*

Duck R., Ben, Color Mills, Wilhoite.—Rep Hinkley and Marsh.—

Everywhere in the Cumberland and Tennessee waters in Virginia, at

The color of the n lighter purplish, very

22. *Lastena lata* (H

Duck R., Columbia Marsh.—I found only

Wherever found, it tribulation in the interior up, in the Cumberland in the lower Tennessee River, and goes up, in to Virginia.

23. *Lasmigona* (Ala

Duck R., Manchester specimens found.

A Cumberlandian Cumberland, and exists

Wilson and Clark d I have not been able age. In the lower, a however, it is rather streams. In the low know it from Jones C Battle Creek, Dover, of the upper Tennessee

Also in Duck River station.

* In addition, it is also not interest us here.

reach the *oviforme*-
might be possible that
really intergrade.

(Lea).

side.—*New for this*
abundant at the latter.
ion.

ported from the Cum-
in the tributaries and
upper Tennessee it is

headwaters, yet asso-
ing into it. I have not
frequently observed in

(Lea).

ed from Columbia by
I found only a few

them, but known from
parts of some of its trib-
the Knoxville region.

as good, that this form
same; at Columbia the

gibber) from Columbia,
Duck River. I did not
among the thousands of
Thus it must be rare,
of the river. But I
nce it is impossible to

interior basin, chiefly
it goes up to the falls,
of the tributaries. In

the Tennessee it is everywhere, up to the Knoxville region and
above, avoiding only the headwaters.

21. *Elliptio dilatatus* (Rafinesque).

Duck R., Ben, Columbia, above Columbia, Leftwich, Lillard's
Mills, Wilhoite.—Reported (as *gibbosus*) from Columbia by
Hinkley and Marsh.—Abundant.

Everywhere in the interior drainage, as well as in the Cum-
berland and Tennessee, from the Mussel Shoals to the head-
waters in Virginia, and in most of the tributaries.

The color of the naere, in Duck River, is mostly darker or
lighter purplish, very rarely white.

22. *Lastena lata* (Rafinesque):

Duck R., Columbia.—Given from same place by Hinkley &
Marsh.—I found only a single male.

Wherever found, this is a rare shell, but it has a wide dis-
tribution in the interior basin, chiefly the Ohio drainage, going
up, in the Cumberland, to Burnside, Pulaski County, Ky., It is
in the lower Tennessee at the Mussel Shoals and in lower Elk
River, and goes up, in the upper Tennessee and Clinch Rivers,
to Virginia.

23. *Lasmigona (Alasminota) holstonia* (Lea).

Duck R., Manchester.—*New for Duck River.*—Half a dozen
specimens found.

A *Cumberlandian species*, but apparently missing in the
Cumberland, and existing only in the Tennessee system. *)

Wilson and Clark do not report it from the Cumberland, and
I have not been able to find a single record from this drain-
age. In the lower, as well as the upper Tennessee system,
however, it is rather abundant, but restricted to the smaller
streams. In the lower Tennessee (below Walden Gorge), I
know it from Jones Creek, Bridgeport, Jackson Co., Ala., and
Battle Creek, Dover, Marion Co., Tenn. In the headwaters
of the upper Tennessee it goes up to Virginia.

Also in Duck River, it has been found only at the uppermost
station.

* In addition, it is also in the Alabama River system, but this does
not interest us here.

24. *Lasmigona (Lasmigona) costata* (Rafinesque).

Duck R., Ben, Columbia, above Columbia, Leftwich, Lillard's Mills, Wilhoite, Shelbyville; Buffalo R., Riverside; Garrison Creek, Wartrace.—Reported from Columbia by Hinkley and Marsh.—Rather uniformly distributed, and abundant in the main river and tributaries.

A species of very wide distribution in the interior basin (and elsewhere), common also in the Cumberland, up to the falls, and the Tennessee, below and above the Gorge, going up to Virginia.

25. *Lasmigona (Pterosyna) complanata* (Barnes).

Duck R., Centreville, Ben, Columbia, above Columbia.—*New for Duck River*.—Not abundant, preferably in quiet pools above the riffles.

In quiet parts of larger rivers in the interior basin, also in the lower Cumberland, up to Harpeth River. Missing in the Tennessee from the Mussel Shoals upward.

26. *Anodonta grandis* Say.

Duck River, Shelbyville (three specimens in a muddy eddy below a riffle).—*New for Duck River*.

Of tremendous distribution in the interior basin (and elsewhere), but very rare in the Cumberland and Tennessee drainages. Reported from ponds near the Cumberland at Clarksville, Montgomery County, Tenn., and from Harpeth and Stones Rivers (found by myself in both of the latter). From the Tennessee, below the Gorge, I know it from Mountain Fork (of Flint R.), New Market, Madison Co., Ala. (Carn. Mus., coll. by H. E. Wheeler), and from the upper Tennessee it was known hitherto only from a pond near Knoxville. But recently (Aug. 16, '23) I found several specimens in Emory River (trib. to Clinch), at Wartburg, Morgan Co., Tenn.

This distribution appears as rather erratic and discontinuous. My Duck River specimens are not large, and represent the typical *grandis*, as found in streams of smaller size, but with the epidermis not so dark as usual. There are traces of

a purplish tint
Max. size: L. 85.

27. *Alasmidonta*

Duck R., Shel
New for Duck Ri
A Cumberland

In the Cumber
self), and in som
the falls. In the
in upper Elk Riv
seam); in the up
Virginia.

It is a typical
rivers. It is also
seen specimens e
River, Whitesbur
the headwaters o
Fish. Doc. 931. 2
chiefly to the nor
calceolus (Lea).
but they are very

28. *Alasmidonta*

Duck River, Co
Mills, Shelbyville;
River by Marsha

In the interior
tributaries, up to
the headwaters.
in the main river.

29. *Strophitus r.*

Duck R., Ben,
ville, Normandy;
trace.—Toward th
from Columbia (a

Common everyw
chiefly in smaller

a purplish tint in the nacre. The beak-sculpture is normal. Max. size: L. 85, H. 54, D. 31 mm.

27. *Alasmidonta (Pressodonta) minor* (Lea):

Duck R., Shelbyville, Normandy; Buffalo R., Riverside.—*New for Duck River*.—Only a few specimens found.

A Cumberlandian type.

In the Cumberland above the falls (collected there by myself), and in some of the tributaries entering this river below the falls. In the Tennessee, below the Walden Gorge, it is in upper Elk River and the upper Sequatchie (Carnegie Museum); in the upper Tennessee it goes in the headwaters up to Virginia.

It is a typical small-creek form, strictly avoiding larger rivers. It is also in the uppermost Kentucky River, and I have seen specimens collected by E. Danglade in N. Fk. Kentucky River, Whitesburg, Letcher Co., Ky., which is not far from the headwaters of the Cumberland (See also: Danglade, Bur. Fish. Doc. 934. '22. p. 5). In the rest of the Ohio drainage, chiefly to the north of the Ohio River, it is represented by *A. calceolus* (Lea). The relations of the two species are obscure, but they are very closely allied.

28. *Alasmidonta (Decurambis) marginata* (Say).

Duck River, Columbia, above Columbia, Leftwich, Lillard's Mills, Shelbyville; Buffalo R., Riverside.—Reported from Duck River by Marshall.—Not abundant.

In the interior basin, and also in the Cumberland and its tributaries, up to the South Fork. Also in the Tennessee up to the headwaters. In the lower Tennessee it is absent or rare in the main river, but exists in most tributaries.

29. *Strophitus rugosus* (Swainson).

Duck R., Ben, Columbia, Lillard's Mills, Wilhoite, Shelbyville, Normandy; Buffalo R., Riverside; Garrison Cr., Warttrace.—Toward the upper parts rather abundant.—Reported from Columbia (as *schaffariana*) by Hinkley and Marsh.

Common everywhere in the interior basin (and elsewhere), chiefly in smaller rivers. Common also in the Cumberland and

Tennessee, up to the headwaters. In the Cumberland also above the falls.

Specimens from Duck River incline, in the main, toward the form called *shaefferianus* (Lea), but not always. The epidermis generally is lighter and brownish, and also the nacre often shades into salmon tints, but the shape is very inconstant.

30. *Ptychobranchnus fasciolare* (Rafinesque).

Duck R., Centreville, Ben, Columbia, above Columbia.—Not abundant.—Given for Columbia by Hinkley and Marsh (as *canachus*).

In the interior basin abundant, chiefly in the Ohio drainage. In Cumberland R., up to the falls, and in some tributaries. From the Mussel Shoals of the lower Tennessee, and several of its tributaries, into the upper Tennessee drainage, up to Virginia, but disappearing in the headwaters.

31. *Ptychobranchnus subtentum* (Say).

Duck R., Columbia, Leftwich, Normandy; Buffalo R., Riverside. Only a few specimens found.—Reported from Columbia by Hinkley and Marsh.

A Cumberlandian type.

Found in the Cumberland from Rowena, Russell Co., Ky., up to the South Fork and the falls, and also in Rockcastle River. In the Tennessee, from the Mussel Shoals and the tributaries of the lower part up to the upper part, and well into the headwaters in Virginia. Most abundant in smaller streams above the range of *P. fasciolare*, and this seems to hold good also in Duck River.

32. *Obliquaria reflexa* Rafinesque.

Duck River, Centreville.—A single dead shell.—Reported from Columbia by Hinkley and Marsh.

Abundant in larger rivers in the interior basin. In the Cumberland in the main river up to the falls, and also in South Fork. In the Tennessee in the main river from the Mussel Shoals to the Knoxville region, entering here the lower parts of some tributaries.

33. *Cyprope*

A single, v
Hinkley and M
species is not

Widely dist
lower and up

34. *Oborari*

Given from
species is eas
did not find i

In the Ohio
up to the Ke
nessee.

35. *Oborari*

Duck R., C
place, only on
Hinkley and

In the inte
larger rivers
have not bee
usual, *subrol*
nessee below
the main riv
region.

36. *Oborari*

Duck R., B
Mills. Wilho
abundant tha
per reaches o

Distributio
ferring the s
age (surely f
lens), and qu

In the upper
Also in Du
len large-rive
up. A single

NATURALIST.

33. *Cyprogenia irrorata* (Lea) .

A single, very large specimen reported from Columbia by Hinkley and Marsh. I did not find a trace of it. But since the species is not easily to be mistaken, I admit it in the list.

Widely distributed in the Ohio drainage, the Cumberland, lower and upper Tennessee, preferring larger streams.

34. *Obovaria (Obovaria) retusa* (Lamarck) .

Given from Columbia by Hinkley and Marsh. Since this species is easily recognized, it should be admitted, although I did not find it.

In the Ohio drainage, the Cumberland, and the Tennessee, up to the Knoxville region, but apparently rare in the Tennessee.

35. *Obovaria (Obovaria) subrotunda* Rafinesque .

Duck R., Columbia, Wilhoite.—Several specimens at the first place, only one at the other, standing close to the next form.—Hinkley and Marsh give it (as *circulus*) from Columbia.

In the interior basin chiefly in the Ohio drainage, in the larger rivers. In the Cumberland, this form and the next have not been separated, but apparently both are found, as usual, *subrotunda* farther down, *lens* farther up. In the Tennessee below the Gorge, this form has not been reported from the main river, but it is present but rare, in the Knoxville region.

36. *Obovaria (Obovaria) subrotunda lens* (Lea) .

Duck R., Ben, Columbia, above Columbia, Leftwich, Lillard's Mills, Wilhoite, Shelbyville; Buffalo R., Riverside.—More abundant than the main form, and taking its place in the upper reaches of the river.—*New for the system.*

Distribution similar to that of the main species, but preferring the smaller streams. It is in the Cumberland drainage (surely in Harpeth River, for *U. depygis* Conrad is a true *lens*), and quite frequent in tributaries of the lower Tennessee. In the upper Tennessee it is, like the main species, rare.

Also in Duck River it is evident, that *subrotunda* is the swollen large-river-form, *lens* the more compressed form farther up. A single specimen of *O. subrotunda*, found at Wilhoite,

makes an exception, but with a diameter of only 62% it stands close to *lens*. At Ben only two specimens were found, one of them, with the diameter of 59%, coming close to typical *subrotunda*.

37. *Actinonaias carinata* (Barnes).

Duck R., Ben, Columbia.—Not very abundant.—New for Duck River.

Very abundant in the interior basin, and chiefly in the Ohio drainage. The typical *A. carinata* is not found in the Cumberland and Tennessee, but is represented there by the var. *gibba* Simpson. This fact is extremely remarkable: the specimens from Duck River undoubtedly belong to the typical *carinata* (the "northern mucket"), and do not have the humped shape of the "southern mucket" (*gibba*). It is, true, var. *gibba* is not very well marked, as specimens from the Cumberland and Tennessee often approach the Ohio-form; and, on the other hand, specimens from Green River, Kentucky, are again more like *gibba*. Yet, as a rule, the two forms are separable.

38. *Actinonaias pectorosa* (Conrad).

Duck R., Ben, Columbia, above Columbia, Leftwich, Lillard's Mills; Buffalo R., Riverside.—Abundant at Columbia and Leftwich.—Recorded by Hinkley and Marsh from Columbia (as *perdix*).

A Cumberlandian form, missing in the interior basin.

Reported, in the Cumberland, from Cloyd's Landing, Cumberland Co., Ky., to the South Fork and the falls, also from some of the tributaries. In the Tennessee, below the Walden Gorge, at the Mussel Shoals, and in several of the tributaries; in the upper Tennessee chiefly towards the headwaters, as far up as Virginia, sometimes quite abundant.

Also in Duck River, this species has its metropolis farther up in the river, than *A. carinata*.

39. *Plagiola lineolata* (Rafinesque).

Reported from Columbia by Hinkley and Marsh (as *securis*). Not seen by myself, but easily recognized. Thus it should be credited to Duck River.

Common in Ohio
Tennessee up to the Ki

40. *Truncilla truncata*

Duck R., Colum
the same place by J

Of very wide dis
In the Cumberland
also in some tribut
Mussel Shoals, in Bear
upper Tennessee in

41. *Truncilla dom*

Duck R., Centrev
Columbia by Hinkle

Distribution very
but with some diff
in the lower Tennes
but is missing in t
found.

42. *Leptodea lept*

Reported (as *ten*
Columbia. Easily rec
overlooked it, since
very long.

A rare species, b
the Cumberland, lov

43. *Leptodea frag*

Duck R., Centrev
ant.—Reported fro
gracilis).

Widely distributed
all along the river
tributaries. In the Ten
tributaries; also in t
the headwaters.

44. *Proptera alata*

Duck R., Centrev

Common in Ohio and Cumberland drainages. In the Tennessee up to the Knoxville region, but rare there.

10. *Truncilla truncata* (Rafinesque).

Duck R., Columbia.—Several specimens.—Reported from the same place by Hinkley and Marsh (as *elegans*).

Of very wide distribution in interior basin and elsewhere. In the Cumberland up to the South Fork and the falls, and also in some tributaries. In the lower Tennessee at the Mussel Shoals, in Bear Creek, and Paint Rock River; rare in the upper Tennessee in the Knoxville region.

11. *Truncilla donaciformis* (Lea).

Duck R., Centreville.—Only one dead shell.—Reported from Columbia by Hinkley and Marsh.

Distribution very much like that of the preceding species, but with some differences. It exists in the Cumberland and in the lower Tennessee (Mussel Shoals and Paint Rock River), but is missing in the upper Tennessee, where *T. truncata* is found.

12. *Leptodea leptodon* (Rafinesque).

Reported (as *tenuissimus*) by Hinkley and Marsh from Columbia. Easily recognized, and thus admitted. I may have overlooked it, since dead shells are not apt to be preserved very long.

A rare species, but widely distributed in the interior basin, the Cumberland, lower and upper Tennessee.

13. *Leptodea fragilis* (Rafinesque).

Duck R., Centreville, Columbia, Lillard's Mills.—Not abundant.—Reported from Columbia by Hinkley and Marsh (as *gracilis*).

Widely distributed in the interior basin. In the Cumberland all along the river up to the South Fork, but not in the tributaries. In the Tennessee below the Gorge, and some of its tributaries; also in the upper Tennessee, with the exception of the headwaters.

14. *Proptera alata* (Say).

Duck R., Centreville, Ben, Columbia.—*New for Duck River.*

Living specimens were taken at the first station, and they were not rare there (chiefly in the quiet pool above the riffles). At the other two localities only a few dead shells were seen.

Distribution very much like that of the preceding species, and generally abundant, also in the Cumberland and Tennessee, with exception of the headwaters. Prefers larger rivers, but sometimes also in smaller ones.

45. *Carunculina moesta* (Lea). *Trochocera hindus?*

Duck R., Wilhoite, Shelbyville.—Several specimens.—*New for Duck River.*

A Cumberlandian type, missing in the interior basin (but represented there by *C. glans*). Reported from tributaries of the Cumberland; known from tributaries of the lower Tennessee, and locally from smaller streams in the upper Tennessee region.

My specimens from Duck River are quite typical in shape and color of epidermis and naere.

46. *Carnuculina cylindrella* (Lea).

Duck R., Coffee Co.; Buffalo R., Riverside.—A number of specimens at the first locality, only one of the second.—Reported from Columbia by Hinkley & Marsh. Duck River is Lea's type locality.

A Cumberlandian type, but not known from the Cumberland drainage, and not known from the upper Tennessee. The Carnegie Museum possesses specimen from the lower Tennessee drainage: upper Elk River, and Flint River in Madison Co., Ala.

This species stands very close to *C. moesta*, but differs in paler (greenish-yellowish) epidermis, and paler naere. The latter may be purplish, or of a peculiar yellowish-white tint. Such specimens are occasionally found in the upper Tennessee region, but always associated with *moesta*. In *C. cylindrella*, the shell is slightly more elongated, both in the male and female, and the postbasal dilatation of the female is less developed than in *moesta*. It is quite possible, that *cylindrella* is only a variety of *moesta*, but in my material from Duck River the two are sharply distinct.

47. *Conradilla ca*

Duck R., Hickory. Only one specimen found by myself.—

A Cumberlandian absent also from the lower and upper Tennessee Rivers (Mor Holston Rivers, up

48. *Medionidus c*

Duck R., Columbia. Normand abundant, chiefly by Hinkley and Marsh.

A Cumberlandian common in the upper River (not above Tennessee drainage, c

49. *Micromya fa*

Duck R., Wilhoite. Reported from Columbia.

In the interior not rare. Not reported from Clark, and apparently Tennessee below upper Tennessee, v. ville region into V

It is quite possible the Cumberland a

50. *Micromya n*

Buffalo R., Riverside. Duck River system

A Cumberlandian by *M. iris*.

Of the many specimens originally reported

the first station, and they
quiet pool above the riffles).
few dead shells were seen.
of the preceding species,
Cumberland and Tennes-
es. Prefers larger rivers,

Several specimens.—*New*
in the interior basin (but
reported from tributaries of
tributaries of the lower Ten-
nessee in the upper Tennes-

are quite typical in shape
Riverside.—A number of
one of the second.—Re-
& Marsh. Duck River is

known from the Cumber-
the upper Tennessee. The
on from the lower Tennes-
and Flint River in Madison

C. moesta, but differs in
is, and paler naere. The
liar yellowish-white tint.
and in the upper Tennes-
C. moesta. In *C. cylindrel-*
ized, both in the male and
of the female is less de-
possible, that *cylindrella* is
material from Duck River

47. *Conradilla cuclata* (Conrad).

Duck R., Hickman Co. (Hartman coll.), Columbia, Left-
wich.—Only one specimen at each of the latter two localities
found by myself.—Found at Columbia by Hinkley and Marsh.

A Cumberlandian type, missing in the interior basin, and
absent also from the Cumberland drainage. Restricted to the
lower and upper Tennessee, from the Mussel Shoals, Elk and
Flint Rivers (Morgan Co., Ala.), to the Clinch, Powell, and
Holston Rivers, up into Virginia.

48. *Medionidus conradicus* (Lea).

Duck R., Columbia, Leftwich, Lillard's Mills, Wilhoite, Shel-
byville, Normandy; Garrison Creek, Wartrace.—Locally
abundant, chiefly at the upper stations.—Found at Columbia
by Hinkley and Marsh.

A Cumberlandian type, not present in the interior basin, but
common in the upper part and tributaries of Cumberland
River (not above the falls), and in the lower and upper Ten-
nessee drainage, chiefly in the tributaries, up to Virginia.

49. *Micromya fabalis* (Lea).

Duck R., Wilhoite.—Several specimens found by myself.—
Reported from Columbia by Hinkley and Marsh, and by Mar-
shall.

In the interior drainage chiefly in tributaries of the Ohio,
not rare. Not reported from the Cumberland by Wilson and
Clark, and apparently absent there, as well as missing in the
Tennessee below Walden Gorge. Present, however, in the
upper Tennessee, chiefly in the headwaters from the Knox-
ville region into Virginia.

It is quite possible that this species has been overlooked in
the Cumberland and lower Tennessee.

50. *Micromya nebulosa* (Conrad).

Buffalo R., Riverside.—Abundant at this place.—*New for*
Duck River system.

A Cumberlandian type, but represented in the interior basin
by *M. iris*.

Of the many synonyms of this species, several have been
originally reported from the Cumberland system: *U. cumber-*

landianus Lea, *notatus* Lea, admitted by Simpson as synonyms; and the following added by Ortmann: *U. obscura* Lea; *sinus* Lea. Call gives also *U. iris* from Rockcastle River. However, none of these has been mentioned from the Cumberland by Wilson & Clark. Yet *M. nebulosa* does exist in the Cumberland drainage, for I have found it myself in the upper Caney Fork at Riverhill, White Co., Tenn. (S. of Sparta), and in its tributary, Barren Fork, at McMinnville, Warren Co., Tenn., and further, the Carnegie Museum possesses specimens collected by C. Goodrich in September, 1923 in Pitman Creek, at Burnside, Pulaski Co., Ky.

In the Tennessee drainage below and above the Walden Gorge, this species is present. It is rare in the larger rivers, but practically everywhere in the smaller streams, and goes, in the headwaters, into Virginia.

Outside of the Cumberland region, it has not been positively found, although some of its synonyms have been occasionally reported; but probably all these records refer to *M. iris*, which, possibly, is only a variety of it.

It is remarkable that in the Duck River drainage, I found this species only in Buffalo River, but that it was extremely abundant here, and associated with, and hard to distinguish from, the next species. Probably it will be found in some other small tributaries of Duck River.

51. *Micromya taeniata* (Conrad).

Duck R., Shelbyville, Normandy; Buffalo R., Riverside.—Few at the first two localities, abundant at the third.—*New for Duck River.*

A *Cumberlandian type*, reported under various names (*taeniatus*, *pictus*, *punctatus*) from the upper Cumberland by Wilson and Clark. I found it myself in West Fork Stones River, and the Carnegie Museum has it from Pitman Creek, Burnside, Ky. (Goodrich). Also known from the lower Tennessee at the Mussel Shoals and from several tributaries in this region, but missing in the whole upper Tennessee system above the Gorge.

This species is very close to *nebulosa*: it is larger, and the color pattern is slightly different, consisting of rather broad,

more or less interrupted spots. Just the latter caused the creation of a new species, for instance, *M. taeniata*. The forms of the latter in their relation to *M. taeniata* are closely related.

Outside of the Cumberland drainage of the *taeniata* group, *Micromya taeniata* is found in the Duck R., Shelbyville, Normandy; Buffalo R., Riverside.—*New for Duck River.*

A *Cumberlandian type*, represented in the upper Cumberland system, it is found in the upper Tennessee drainage, and from the smaller streams, and from the headwaters, into Virginia.

However, specimens from the Tennessee drainage, as well as from the upper Tennessee drainage, and from the headwaters, into Virginia, are very similar to the *taeniata* group, and we appear to have a transition form between the two forms, the latter has been reported from the Tennessee drainage, and from the headwaters, into Virginia.

My specimens from the Duck River drainage, and from the headwaters, into Virginia, are very similar to the *taeniata* group, and we appear to have a transition form between the two forms, the latter has been reported from the Tennessee drainage, and from the headwaters, into Virginia.

* Unless *U. nashvillensis* is a new species, *U. taeniata*, should be this. The latter, below, might suggest this.

mitted by Simpson as synonyms; Putnam: *U. obscura* Lea; *simus* from Rockcastle River. However, named from the Cumberland by *taeniata* does exist in the Cumberland at myself in the upper Caney Tenn. (S. of Sparta), and in its (Minnville, Warren Co., Tenn., Museum possesses specimens collected in 1923 in Pitman Creek,

below and above the Walden It is rare in the larger rivers, the smaller streams, and goes, in region, it has not been positively synonyms have been occasionally records refer to *M. iris*, which,

Duck River drainage, I found over, but that it was extremely with, and hard to distinguish ably it will be found in some River.

nd). andy; Buffalo R., Riverside.— abundant at the third.—*New*

ported under various names from the upper Cumberland by myself in West Fork Stones um has it from Pitman Creek, o known from the lower Ten- ad from several tributaries in whole upper Tennessee system

nebulosa: it is larger, and the nt, consisting of rather broad,

more or less interrupted rays, often dissolving into isolated spots. Just the latter character is very variable, and has caused the creation of several nominal species. But I am unable, for instance, to distinguish: *taeniata*, *picta*, and *punctata*. The forms of this group require additional study, and also their relation to *M. nebulosa* should be investigated more closely.

Outside of the Cumberland region, in the interior basin, no shells of the *taeniata* type are known.

52. *Micromya vanuxemensis* (Lea).

Duck R., Shelbyville, Normandy; Buffalo R., Riverside; Garrison Creek, Wartrace.—Abundant at Shelbyville and Riverside.—*New for Duck River.* *)

A Cumberlandian type, not known in the interior basin (but represented in the upper Alabama drainage). From the Cumberland system, it has been reported by Wilson and Clark (W. Fk. Red R., Ringgold, Montgomery Co., Tenn.), and probably *lienosa* from the main river at Clarksville, from below the falls, and E. Fk. Stones R., also belongs here. In the lower and upper Tennessee this species is abundant, generally preferring the smaller streams.

However, specimens from larger rivers in the upper Tennessee drainage, as well as from the whole lower Tennessee drainage, and from Duck River, do not represent the typical phase of the species, and do not have, in the female, that characteristic constriction of the shell behind the postbasal expansion, or it is only weakly indicated (equals *pybasi*-type). Such forms approach *M. lienosa* (Conrad) of the Alabama system, and we apparently have here the actual transition between the two forms, which explains the fact that repeatedly the latter has been reported from the upper and lower Tennessee and from the Cumberland.

My specimens from the Duck system have mostly dark-purple naere, often with whitish margin. But one female from Wartrace is entirely white inside. A male from Shelbyville

* Unless *U. nashvillensis*, reported by Hinkley & Marsh from Columbia, should be this. The large specimen of *M. vanuxemensis*, mentioned below, might suggest this.

has gigantic proportions: L. 75, H. 43, D. 27 mm. The normal maximum length is between 50 and 60 mm.

53. *Ligumia recta latissima* (Rafinesque).

Reported from Columbia by Hinkley and Marsh. It should be included in the list, since this species is unmistakable. I did not see a trace of it.

Common everywhere in the interior basin, the Cumberland, lower and upper Tennessee, but apparently rare in Duck River.

54. *Lampsilis anodontooides* (Lea).

Duck R., Centreville.—Rather abundant, but only dead shells found.—*New for Duck River.*

A common form in the larger rivers of the interior basin, going up, in the Cumberland, to Willson Co., Tenn. Also in lower Harpeth River. In the Tennessee, it is known only from the Mussel Shoals (Hinkley, Nautilus, 20, '06), but not higher up.

55. *Lampsilis ovata* (Say).

Duck R., Ben, Columbia, Leftwich, Wilhoite.—Not rare.—Mentioned from Columbia by Hinkley and Marsh.

A form of wide distribution in the Ohio drainage, chiefly in the larger rivers, but apparently missing from the lower Ohio westward and northward. In the Cumberland it is all along the main river up to the falls (transplanted above the falls). Also everywhere in the Tennessee proper, from the Mussel Shoals (and lower Paint Rock River) up to the Knoxville region, and going here upward a certain distance in the larger tributaries.

56. *Lampsilis ovata ventricosa* (Barnes).

Duck R., Columbia, above Columbia, Lillard's Mills, Wilhoite, Shelbyville; Buffalo R., Riverside; Garrison Creek, Wartrace.—Not rare.—*New for Duck River.*

Distribution similar to that of the preceding form, often associated and intergrading with it, and gradually taking the place of it in the headwaters. In the Cumberland system chiefly in the tributaries. Everywhere in the Tennessee drain-

age, but again me to Virginia.

Also in Duck R. the upstream direction.

57. *Lampsilis fu*

Duck R., Columbia R., Riverside

Reported from (collected) and Ma

Very widely distributed or missing in the upper parts,

where in the lower abundant in the Carolina and Virg

58. *Dysnomia (T*

Duck R., Columbia, Shelbyville.—Rare in Marsh (as *triangula*)

Frequent in the Reported by Wilson Russell Co., Ky., at in the lower and up

59. *Dysnomia (T*

Duck R., Columbia dead specimen found by Hinkley and Ma

A Cumberlandia reported from the C

Wilson and Clark Known from the lo Elk River. More Knoxville region an

60. *Dysnomia (T*

Given from Colum

55. H. 43, D. 27 mm. The normal size is 50 and 60 mm.

(Rafinesque).

by Hinkley and Marsh. It should be noted that this species is unmistakable. I

in the interior basin, the Cumberland, but apparently rare in Duck

(Lea).

is rather abundant, but only dead specimens were found in the Duck River.

larger rivers of the interior basin, up to Willson Co., Tenn. Also in the Tennessee, it is known only at Hinkley, Nautilus, 20, '06), but not

at Leftwich, Wilhoite.—Not rare.—Reported by Hinkley and Marsh.

is common in the Ohio drainage, chiefly in the upper parts, but is entirely missing from the lower Ohio. In the Cumberland it is all along the river (transplanted above the falls). In Tennessee proper, from the Mussel Shoals (Duck River) up to the Knoxville region, it is found a certain distance in the larger

ovata (Barnes).

at Columbia, Lillard's Mills, Wilhoite, Riverside; Garrison Creek, and for Duck River

of the preceding form, often associated with it, and gradually taking the place of it. In the Cumberland system it is found everywhere in the Tennessee drain-

age, but again mostly in the tributaries and the headwaters, up to Virginia.

Also in Duck River, *ventricosa* gradually displaces *ovata* in the upstream direction. Intergrades between the two are frequent.

57. *Lampsilis fasciola* (Rafinesque).

Duck R., Columbia, Leftwich, Lillard's Mills, Wilhoite; Buffalo R., Riverside; Garrison Cr., Wartrace.—Rather abundant. Reported from Columbia by Hinkley and Marsh (as *per-radiatus*) and Marshall (as *multiradiatus*).

Very widely distributed in the Ohio basin, yet apparently rare or missing in the Mississippi, preferring streams of medium or small size. In the Cumberland abundant, chiefly in the upper parts, below the falls, and in tributaries. Everywhere in the lower and upper Tennessee drainage, and most abundant in the tributaries up to the headwaters in North Carolina and Virginia.

58. *Dysnomia (Truncillopsis) triquetra* (Rafinesque).

Duck R., Columbia, above Columbia, Leftwich, Wilhoite, Shelbyville.—Rare.—Reported from Columbia by Hinkley and Marsh (as *triangularis*).

Frequent in the interior basin, chiefly in the Ohio drainage. Reported by Wilson and Clark from the Cumberland, up to Russell Co., Ky., and from Obey River. Of general distribution in the lower and upper Tennessee, in larger and smaller rivers.

59. *Dysnomia (Truncillopsis) brevidens* (Lea).

Duck R., Columbia, Wilhoite.—Only two living and one dead specimen found by myself.—Mentioned from Columbia by Hinkley and Marsh.

A Cumberlandian type, missing in the interior basin. Reported from the Cumberland at Nashville by Conrad, and by Wilson and Clark from Beaver Creek and the South Fork. Known from the lower Tennessee from the Mussel Shoals and Elk River. More abundant in the upper Tennessee in the Knoxville region and above.

60. *Dysnomia (Truncillopsis) lenior* (Lea).

Given from Columbia by Hinkley and Marsh. It could only

be confounded with *brevicens*, but since also the latter has been mentioned by the same authors, the identification must be accepted. I did not see it, but it is a rare species, easily overlooked.

The type locality is in Stones River (Cumberland drainage). In the Tennessee system, below the Gorge, it is frequent in Paint Rock River; in the upper Tennessee it is in the headwaters of the Clinch and Holston. Thus it is a Cumberlandian type, absent in the interior basin.

61. *Dysnomia (Pilea) turgidula* (Lea).

Duck R., Shelbyville.—Abundant.—Given from Columbia by Hinkley and Marsh (as *deviatus* and *turgidulus*).

A Cumberlandian type. * Reported by Lea from Cumberland River, but not by Wilson and Clark. Found in the lower Tennessee at the Mussel Shoals in Alabama (Lea), in Bear Creek, (Carn. Mus.), and Shoals Creek (Hinkley). In the upper Tennessee system it is in Holston and Emory Rivers.

This species is a close relation to *D. biemarginata* (Lea) (see: Ortman, Proc. Amer. Philos. Soc. 57, '18, p. 590), and may be the headwaters-form of it. *D. biemarginata* is known from the lower Tennessee and its larger tributaries (Elk and Paint Rock Rivers). Aside from Lea's record for *turgidula* from Cumberland River, *D. biemarginata* is in the Cumberland and the South Fork at Burnside, Ky. (Walker collection).

The material collected by myself at Shelbyville is very fine, containing a good number (about two dozen) of males and females (among the latter gravid ones) of different ages.

62. *Dysnomia (Pilea) florentina walkeri* (Wilson and Clark).

Duck R., Lillard's Mills, Wilhoite.—Rare.—This is probably the form reported as *florentinus* from Columbia by Hinkley and Marsh.

A Cumberlandian type, missing in the interior basin. Found

* It is present also in the Ozark region, in Missouri as *Truncilla curtisi* Frierson and Utterback (Amer. Midl. Natural., 4, 1916, p. 90). This peculiar distribution is found in some other Cumberlandian forms (*Carunculina moesta*, for instance), and is highly interesting and significant, but may be dismissed for the present.

in the Cumberland
Stones R., Walterh
Clark), and in the
head shell collected
the Tennessee, below
meane Cr., Gurley
Mus.), and Limesto
(Walker collection)
Holston R., up to
walkeri, Ortman, l
'92).

D. florentina and
with each other. S
Knoxville), which I
intergrades, but she
should be regarded a

Since this has no
would be in order to
material at hand.

At the Mussel Sho
the height and diam
from 75-79% (aver
localities (Stones R.,
ston) the H. is less, l
Holston it reaches th
the H. of the shell o
walkeri, the former
less than 75%, keep
transitional specimen

For the female, l
Shoals, it averages
76%, in the lower H
R., 73%, Stones R.,
and maxima of the s
this condition appare
ment of the postbasal

The D. of the mal
varies from 50 to 62
places, it is distinctly

since also the latter has
 the identification must
 it is a rare species, easily

(Cumberland drainage).
 Gorge, it is frequent in
 Tennessee it is in the head-
 Thus it is a *Cumberlandian*
 (Lea).
 (Given from Columbia by
turgidulus).
 by Lea from Cumberland
 Found in the lower Ten-
 (Lea), in Bear Creek,
 (Hinkley). In the upper Ten-
 (Mory Rivers.

to *D. biemarginata* (Lea)
 Soc. 57, '18, p. 590), and
D. biemarginata is known
 larger tributaries (Elk and
 Lea's record for *turgidula*
marginata is in the Cumber-
 (Walker collection).
 at Shelbyville is very fine,
 (two dozen) of males and fe-
 (4) of different ages.

walkeri (Wilson and
 e.—Rare.—This is prob-
 from Columbia by Hink-
 in the interior basin. Found

in Missouri as *Truncilla cur-*
d. Natural., 4, 1916, p. 90).
 in other Cumberlandian forms
 is highly interesting and sig-
 nificant.

in the Cumberland system at the type locality, E. Fk.
 Stones R., Walterhill, Rutherford Co., Tenn. (Wilson and
 Clark), and in Harpeth R., Belleview, Davidson Co., Tenn.
 (dead shell collected by myself). It exists in tributaries of
 the Tennessee, below the Walden Gorge; Flint R., and Hur-
 ricane Cr., Gurley and Maysville, Madison Co., Ala. (Carn.
 Mus.), and Limestone Cr., Mooresville, Limestone Co., Ala.
 (Walker collection), and in the upper Tennessee drainage in
 Holston R., up to Virginia (see: *Truncilla florentina* and
walkeri, Ortman, Proc. Amer. Philos. Soc. 57, 1918, pp. 591,
 592).

D. florentina and *walkeri* are closely allied, and intergrade
 with each other. Specimens from the lower Holston (above
 Knoxville), which I mentioned (l. c.) as *Tr. florentina*, are
 intergrades, but should be better placed with *walkeri*, which
 should be regarded as a variety of *florentina*.

Since this has not been fully realized hitherto, I think it
 would be in order to substantiate this by a fuller account of the
 material at hand.

At the Mussel Shoals, the type locality for *florentina*, both
 the height and diameter of the *male* shell is great, the H. being
 from 75-79% (average 77%) of the length. At all other lo-
 calities (Stones R., Duck R., Flint R., lower and upper Hol-
 ston) the H. is less, between 66 and 75%, and only in the lower
 Holston it reaches the maximum of 75%. Thus, for the *male*,
the H. of the shell can be used to distinguish florentina and
walkeri, the former having the H. of 75% or over, the latter
 less than 75%, keeping in mind, that in the lower Holston
 transitional specimens are present.

For the *female*, H. is not important, for, at the Mussel
 Shoals, it averages 73.5%, in Duck R., 75%, in Flint R.,
 76%, in the lower Holston 76%, upper Holston 77%, Harpeth
 R., 73%, Stones R., (type loc. for *walkeri*) 73%, the minima
 and maxima of the several localities broadly overlapping. For
 this condition apparently the great variability in the develop-
 ment of the postbasal expansion is responsible.

The D. of the *male* at the Mussel Shoals also is great. It
 varies from 50 to 62%, with an average of 57%. At other
 places, it is distinctly less, as is shown by the following aver-

ages: Duck R., 45%, Flint R., 45%, lower Holston, 50%, upper Holston, 40%, Stones R., 45.5%. Again we have, in the lower Holston, a close connection of the two forms, the D. varying here from 47 to 52%, so that the males from the lower Holston stand very near to the typical *florentina*, although the latter (from the Mussel Shoals) are in the average more swollen.

It is the Diameter of the shell, by which the females of the two forms may be separated. At the Mussel Shoals, it is 50 to 53% (average 51.5%, but comparatively few specimens at hand.) At the other localities it is never over 50%, and it is again in the lower Holston, where this figure reaches the maximum, the average being 47%. For the rest, it is considerably lower: 42% in Duck R., 43% in Flint R., 41% in the upper Holston, 41% in Harpeth R., and 40% in Stones R.

Thus we get the following diagnostic characters:

Male: H. 75% or over; D. 50% or over. Female: D. 50% or over
 -----*florentina*
 Male: H. under 75% D. mostly under 50%. Female: D. less than
 50% -----*walkeri*

This is an additional case to those given by me (Proc. Amer. Philos. Soc. 59, '20, p. 269 ff.), where the *Diameter (or obesity), of the shell changes with the size of the river: the larger rivers have the swollen florentina (Mussel Shoals only, thus far); in the smaller ones this passes into the more compressed walkeri. In the lower Holston we have the actual intergrades.*

There is an additional character to be considered. This is absolute size. According to the material at hand, *florentina* from the Mussel Shoals, and *walkeri* from the Duck, Flint, and lower Holston, are rather small (maximum L. in males 39 to 42 mm., in females 33 to 38 mm.), while in upper Holston, Harpeth, and Stones, the maxima are: males 51 to 52 mm., females, 48 to 58 mm. This is a great contrast, but cannot be used for the distinction of the two forms, since it does not apply to the *walkeri*-type of Duck, Flint, and lower Holston. But, of course, it again suggests the close connection of these forms.

The males of *D. florentina walkeri*, closely resemble those of the next species (*capsaeformis*), but they differ chiefly in

color. The epidermis of the latter not very shagreened, dark-green and *capsaeformis* is greenish (corresponding scale), which is particularly striking.

63. *Dysnomia (Pile*

Duck R., Cumberland River rather abundant.—D

A Cumberland fly quite abundant in it runs up to the South end in the main river above upper Tennessee in I

In all females color grayish to blackish, greenish-white so of

FAUNISTIC APP

My chief object in Naiades is to ascertain and its probable origin for this purpose. They are very widely distributed in the river system, and they are rather uniformly found. The River belongs at the mouth of the Ohio, Cumberland, and the Grand Gorge. The fol

1. *Amblema costata*
2. *Quadrula pustulos*
3. *Qu. verrucosa*
4. *Qu. cylindrica*
5. *Caelonias tuberos*
6. *Pleurobema corda*
7. *Pl. cord. catillus*
8. *Pl. cord. pyramida*
9. *Elliptio crassidem*
10. *Ell. dilatatus*

TRIALIST.

Holston, 50%, upper
have, in the lower
forms, the D. varying
from the lower Holston
forms, although the latter
average more swollen.

Each the females of the
Mussel Shoals, it is 50
only a few specimens at
over 50%, and it is
his figure reaches the
for the rest, it is com-
in Flint R., 41% in
and 40% in Stones R.
characters:

- Female: D. 50% or
-----*florentina*
- Female: D. less than
-----*walkerii*

by me (Proc. Amer.
the *Diameter (or ob-*
ere of the river: the
(Mussel Shoals only,
es into the more com-
we have the actual in-

be considered. This is
el at hand, *florentina*
in the Duck, Flint, and
m L. in males 39 to
ile in upper Holston.
males 51 to 52 mm.,
contrast, but cannot
ems, since it does not
and lower Holston.
connection of these

osely resemble those
they differ chiefly in

der. The epidermis is yellowish-brown, with greenish rays,
the latter not very sharply defined, but never confluent into a
broad, dark-green area upon the flattened part of the disk. *D.*
capsaeformis is greenish, with darker rays, and a dark green
area (corresponding to the dark green expansion of the fe-
male), which is practically always visible, and often very
striking.

61. *Dysnomia (Pilea) capsaeformis* (Lea).

Duck R., Columbia, Leftwich, Lillard's Mills, Wilhoite.—
Rather abundant.—*New for Duck River.*

A Cumberland type, not found outside of this region, but
quite abundant in it. Known in the Cumberland from Nash-
ville up to the South Fork. Everywhere in the lower Tennes-
see in the main river and most of its tributaries, and in the
upper Tennessee in larger and smaller streams up to Virginia.

In all females collected, the "pad" of the mantle margin was
grayish to blackish, and never of that peculiar blueish or
greenish-white so often seen in upper Tennessee specimens.

FAUNISTIC AFFINITIES OF THE DUCK RIVER NAIADES.

My chief object in publishing the above list of Duck River
Naiades is to ascertain the relations of this fauna to others,
and its probable origin. But not all species can be used for
this purpose. There is a large number of them, which are
very widely distributed, without pointing to any particular
river system, and this holds good for all those, which are
rather uniformly found in the "interior basin" (to which Duck
River belongs at the present time), that is to say, chiefly in the
Ohio, Cumberland, and Tennessee, below and above the Wal-
den Gorge. The following forms belong to this class:

- | | |
|----------------------------------|---------------------------------------|
| 1. <i>Amblyma costata</i> | 11. <i>Lastena lata</i> |
| 2. <i>Quadrula pustulosa</i> | 12. <i>Lasmigona costata</i> |
| 3. <i>Qu. verrucosa</i> | 13. <i>Anodonta grandis</i> |
| 4. <i>Qu. cylindrica</i> | 14. <i>Alasmidonta marginata</i> |
| 5. <i>Cyclonaias tuberculata</i> | 15. <i>Strophitus rugosus</i> |
| 6. <i>Pleurobema cordatum</i> | 16. <i>Ptychobranchus fasciolaris</i> |
| 7. <i>Pl. cord. catillus</i> | 17. <i>Obilquaria reflexa</i> |
| 8. <i>Pl. cord. pyramidatum</i> | 18. <i>Cypregenia irrorata</i> |
| 9. <i>Elliptio crassidens</i> | 19. <i>Obovaria retusa</i> |
| 10. <i>Ell. dilatatus</i> | 20. <i>Ob. subrotunda</i> |

- | | |
|--------------------------------|------------------------------------|
| 21. <i>Ob. subrotunda lens</i> | 27. <i>Ligumia recta latissima</i> |
| 22. <i>Plagiola lineolata</i> | 28. <i>Lampsilis ovata</i> |
| 23. <i>Truncilla truncata</i> | 29. <i>L. ov. ventricosa</i> |
| 24. <i>Leptodea leptodon</i> | 30. <i>L. fasciola</i> |
| 25. <i>L. fragilis</i> | 31. <i>Dysnomia triquetra</i> |
| 26. <i>Proptera alata</i> | |

Some of these are decidedly rare in the upper Tennessee, namely: *Quadrula verrucosa*, *Anodonta grandis*, *Obliquaria reflexa*, *Obovaria retusa*, *Obovaria subrotunda*, *Obovaria subrotunda lens*, *Plagiola lineolata*; and these lead us to another group of species, which have a similar wide distribution as those named above; but are *missing in the upper Tennessee*:

- | | |
|---------------------------------|-----------------------------------|
| 32. <i>Megaloniias gigantea</i> | 34. <i>Truncilla donaciformis</i> |
| 33. <i>Quadrula fragosa</i> | 35. <i>Lampsilis anodontoides</i> |

These 35 forms make 56% of the total of the Duck River fauna, that is to say, over half of it consists of elements which have a very wide distribution over most of the present interior drainage.

These species do not tell us more than the obvious fact, that the Duck River fauna largely belongs to the Mississippi-Ohio basin, as it ought to, since, at the present time, Duck River (as well as Cumberland and Tennessee) form part of this hydrographic basin. The four last named forms, however, suggest that the immigration was in this region in an upstream direction, for these species have not been able to reach the most remote part of this drainage, the upper Tennessee. This may be the case also in at least some of the others, and it should be pointed out, that, with the exception of *Anodonta grandis*, which is a small creek- and pond-form, all these species are either large-river-forms, or else inhabit indiscriminately larger and smaller streams. This would place their centre of radiation well downstream, i. e. near the centre of the interior basin, in the region of the lower Ohio. Of course, it is impossible to exactly locate the place of origin, without detailed study of the range of each species, and, on the other hand, it is quite possible, that some of them actually have originated in the Cumberland region, whence they migrated down the rivers toward the Ohio.

To the above list we are to add several other shells, which

seem to have had a similar but which did not reach region.

First, there is a species basin, and found in the C in the Tennessee:

36. *Lasmigona complanata*

Further, there are two s the interior basin, and exist from both the Cumberland

37. *Quadrula quadrula*

And finally a species sho ular distribution:

39. *Micromya fabalis*

This is in Duck River an the Cumberland and the lov age, it is abundant, and th group of widely distributed

Thus the percentage of fa sibly are to be regarded as basin (Ohio-drainage chiefly

All other species of Duck from the interior basin, i. e land-Tennessee drainages. which designation may be they largely belong to the C Allegheny Valley (upper Te in this sense, and applied t calls the "Cumberland subre (See: Bull. U. S. Nat. Mus. *Gastropods*, forming a subdi the "Eastern Province." The been variously defined, but Valley of Eastern Tennessee ing parts, chiefly of the Cu land Region in our sense, c ludes the *drainages of the*

- recta latissima*
- ocuta*
- atensis*
- triquetra*

upper Tennessee, *Obliquaria re-*
dis, *Obliquaria re-*
dis, *Obliquaria re-*
and us to another
distribution as
upper Tennessee:

- donaciformis*
- anodontoides*

of the Duck River
of elements which
the present interior

obvious fact, that
the Mississippi-Ohio
time, Duck River
part of this hyd-
as, however, sug-
on in an upstream
able to reach the
Tennessee. This
the others, and it
tion of *Anodonta*
form, all these
habit indiscrimi-
would place their
the centre of the
lio. Of course, it
origin, without de-
and, on the other
om actually have
ce they migrated
other shells, which

seem to have had a similar upstream direction of migration, but which did not reach all of the Cumberland-Tennessee region.

First, there is a species widely distributed in the interior basin, and found in the Cumberland, but altogether missing in the Tennessee:

- 36. *Lasmigona complanata*

Further, there are two species, also of wide distribution in the interior basin, and existing also in Duck River, but absent from both the Cumberland and Tennessee drainages:

- 37. *Quadrula quadrula*
- 38. *Actinonaias carinata*

And finally a species should be mentioned of rather irregular distribution:

- 39. *Micromya fahalis*

This is in Duck River and the upper Tennessee, but not in the Cumberland and the lower Tennessee. In the Ohio-drainage, it is abundant, and thus it surely falls in this general group of widely distributed species.

Thus the percentage of forms (39) which probably or possibly are to be regarded as *elements belonging to the interior basin* (Ohio-drainage chiefly) rises to about 62%.

All other species of Duck River (about 38%) are not known from the interior basin, i. e. not from outside of the Cumberland-Tennessee drainages. They are the *Cumberlandian* types, which designation may be properly used for them, because they largely belong to the Cumberland Plateau and the Great Allegheny Valley (upper Tennessee). A *Cumberland Region*, in this sense, and applied to *freshwater forms*, naturally recalls the "Cumberland subregion" introduced by W. G. Binney (See: Bull. U. S. Nat. Mus. No. 28, '85 p. 33) for the *Land-Gastropods*, forming a subdivision of the "Interior Region" of the "Eastern Province." The boundaries of this subregion have been variously defined, but they always included the Great Valley of Eastern Tennessee, and more or less of the adjoining parts, chiefly of the Cumberland Plateau. The *Cumberland Region* in our sense, refers to freshwater life, and includes the *drainages of the Cumberland and Tennessee rivers*

only, from the headwaters down, but leaving out the lower-most sections of the two rivers. It ends, in the Cumberland, about in the vicinity of Clarksville, Montgomery Co., Tenn., for below this point hardly any Cumberlandian shells are known. In the Tennessee, the lower limit of this fauna has not been determined. The Mussel Shoals in Alabama surely possess this fauna, but the whole Tennessee below this point is entirely unknown. Duck River empties into this part of the Tennessee, and, according to my collections, also the lower part of Duck River does not seem to belong any more to the Cumberlandian Region (see below).

Nobody ever has made an attempt to study the Cumberlandian Naiad-fauna, and to single out the forms belonging to it, although attention frequently has been called to the fact, that in this general region a great number of peculiar mussels are found. Thus it will be of interest to know *which species should be regarded as Cumberlandian in the sense here defined.*

It should be noticed that these Cumberlandian shells are not all uniformly distributed over the Cumberland and Tennessee drainages, although there are some which are so. But others are more local. Further, a study of these forms (and of others) brings out the fact, that the Tennessee drainage itself is divided into two sections, that *below-Walden Gorge* (below Chattanooga), with its tributaries down to the Mussel Shoals, and that *above this point*, including all the headwaters.†)

*Duck River species of general distribution in Cumberland, lower and upper Tennessee: **

* Also in the Cumberland such a division is evident, namely the part below the falls, and that above. But the latter is rather small and poor in species. Nevertheless, zoögeographically, it surely is interesting, and should receive due consideration in a special study of the Cumberland River fauna.

† In some of the varieties the distribution is not fully known, chiefly in the Cumberland, because their taxonomy has not been studied from the modern viewpoint introduced by myself in my paper on the upper Tennessee shells (Proc. Amer. Philos. Soc. 57., '18). Thus it was necessary sometimes, to unite these forms into groups.

THE NAIAD-FAUN

- 1, 2. *Fusconia barnesi* varieties, but only Cumberl.; a third (Duck).
3. *Quadrula intermedia*
- 4, 5, 6. *Pleurobema* (three varieties, only itively in Cumberland)
7. *Alasmidonta minor*
8. *Ptychobranthus subit*

Duck River species for but not in the Cumber

19. *Lexingtonia dolabellii*
20. *L. dolab. conradi*

Duck River species for but not in upper Ten

23. *Micromya taeniata*

Duck River species for Cumberland, and not

24. *Carmentina cylindrell*

Thus 24 species of the types, that is to say, 38

It should be pointed River, which are present the Tennessee, as there restricted to the Cumberland *no peculiar species of it.*

These 24 forms enumerated-types known. The Cumberland and Tennessee, or been found in Duck River list of them, with short that *we thus get a complete the Cumberlandian Nai*

I leave out the group *pilaris* should not be separated basin.

25. *Fusconala cuncohis* (L and upper Tennessee, 1

... leaving out the lower-lands, in the Cumberland, Montgomery Co., Tenn., Cumberlandian shells are the limit of this fauna has the Shoals in Alabama surely Tennessee below this point is ... into this part of the collections, also the lower to belong any more to the

... apt to study the Cumberland out the forms belonging to has been called to the fact, number of peculiar mussels that to know which species in the sense here defined, Cumberlandian shells are not Cumberland and Tennessee which are so. But others of these forms (and of Tennessee drainage itself *Low-Walden Gorge* (below down to the Mussel Shoals, all the headwaters.†)

Distribution in Cumberland,

... tion is evident, namely the part latter is rather small and poor ly, it surely is interesting, and social study of the Cumberland

... tion is not fully known, chiefly ay has not been studied from off in my paper on the upper Soc. 57., '18). Thus it was into groups.

- | | |
|---|----------------------------------|
| 1, 2. <i>Fusconia barnesian</i> (two varieties, but only one in Cumberland; a third not in Duck). | 9. <i>Actionaias pectorosa</i> |
| 3. <i>Quadrula intermedia</i> | 10. <i>Carunculina moesta</i> |
| 4, 5, 6. <i>Pleurobema oviforme</i> (three varieties, only one positively in Cumberland). | 11. <i>Medionidus conradicus</i> |
| 7. <i>Alasmidonta minor</i> | 12. <i>Micromya nebulosa</i> |
| 8. <i>Ptychobranchnus subtentum</i> | 13. <i>M. vanuxemensis</i> |
| | 14. <i>Dysnomia brevidens</i> |
| | 15. <i>D. lenior</i> |
| | 16. <i>D. turgidula</i> |
| | 17. <i>D. florentina walkeri</i> |
| | 18. <i>D. capsaeformis</i> |

Duck River species found in the lower and upper Tennessee, but not in the Cumberland:

- | | |
|--------------------------------------|--------------------------------|
| 19. <i>Lexingtonia dolabelloides</i> | 21. <i>Lasmigona holstonia</i> |
| 20. <i>L. dolab. conradi</i> | 22. <i>Conradia caelata</i> |

Duck River species found in Cumberland and lower Tennessee, but not in upper Tennessee:

23. *Micromya taeniata*

Duck River species found only in lower Tennessee, but not in Cumberland, and not in upper Tennessee:

24. *Carunculina cylindrella*

* Thus 24 species of the Duck River fauna are Cumberlandian types, that is to say, 38% of the fauna.

It should be pointed out, that there are no species in Duck River, which are present only in the Cumberland, but not in the Tennessee, as there seem to be no Cumberlandian species, restricted to the Cumberland alone, i. e. *Cumberland River has no peculiar species of its own!*

These 24 forms enumerated above are not all the Cumberland-types known. There are others, found either in Cumberland and Tennessee, or in Tennessee alone, which have not been found in Duck River. I think it is well to give here a list of them, with short indications of their distribution, so that we thus get a complete account of what should be called *the Cumberlandian Naiad fauna.*

I leave out the group of *Fusconaiia pilaris*, because, probably, *pilaris* should not be separated from *subrotunda* of the interior basin.

25. *Fusconata cuncolus* (Lea)—26. *F. cun. appressa* (Lea).—In lower and upper Tennessee, but not in Cumberland, the former in small

20

- streams, the latter in larger ones.
27. *Fusconia edgariana* (Lea)—28. *F. edg. analoga* (Ortmann).—Like the preceding two forms, the former in the larger, the latter in the smaller streams.
 29. *Fusconia barnesiana tumescens* (Lea).—Reported from the Cumberland (as *Pleurobema crudum*). In larger rivers in lower and upper Tennessee.
 30. *Quadrula cylindrica strigillata* (Wright).—Headwaters of Powell, Clinch, and Holston only.*
 31. *Pleurobema cyphus compertus* (Frierson).—Local form in the Knoxville region.
 32. *Alasmidonta (Decurambis) raveneliana* (Lea).—Local form in headwaters of French Broad and Pigeon Rivers in North Carolina.
 33. *Pegias fabula* (Lea).—In the Cumberland drainage in Rockcastle and Stones River; small streams of lower, and headwaters of upper Tennessee.
 34. *Dromus dromas* (Lea).—35. *Dr. dr. caperatus* (Lea).—Cumberland, lower and upper Tennessee, the former in the larger rivers, the latter in the smaller ones; the small-river form has not yet been found in lower Tennessee.
 36. *Micromya trabalis* (Conrad).—Metropolis in Cumberland and tributaries. Rare in lower Tennessee (Mussel Shoals and Paint Rock River). In upper Tennessee only in Chickamauga Creek (near Chattanooga) and in Hiwassee River.
 37. *Micromya perpurpurea* (Lea).—Only in Clinch, Powell, and Emory Rivers, representing *trabalis*.
 38. *Lampsilis virescens* (Lea).—In lower Tennessee, Emory River, and Coal Creek (Clinch drainage) (See: Ortmann, '18 p. 582). Recently an additional locality has been discovered: Emory R., Wartburg, Morgan Co., Tenn.
 39. *Dysnomia (Truncillopsis) araeformis* (Lea).—Upper Cumberland and lower Tennessee (Mussel Shoals) (rare). Abundant in the Knoxville region of the upper Tennessee.
 40. *Dysnomia (Scalenilla) haysiana* (Lea).—Not rare in Cumberland, lower and upper Tennessee.
 41. *Dysnomia (Dysnomia) stewardsoni* (Lea).—Knoxville region of upper Tennessee.
 42. *Dysnomia (Dysnomia) lewisi* (Walker).—Cumberland River, Burnside, Ky., and Knoxville region of the upper Tennessee.
 43. *Dysnomia (Pilea) torulosa gubernaculum* (Reeve).—Upper Tennessee from the Knoxville region upward.
 44. *Dysnomia (Pilea) biemarginata* (Lea).—Probably large-river-form of *D. turgidula*. Known from Cumberland (Burnside) and the Mussel Shoals in the lower Tennessee. Not in upper Tennessee.

* I do not believe that it is found elsewhere, as recently reported.

45. *Dysnomia* (F. Mussel Shoals Cumberland River

Finally there the Cumberland ably is not a type in Green River, collected it myself

This complete as I am able to above we may be in the Cumberland reason, that at species out of the over half of them

But it is quite have their origin quently dispersed and the interior here to single the this task.

No faunistic forms which po found. It is clear species is missing been found; this cerns widely distributed forms, the argu greater force. A River are thickly to examine also in the above list there are others, give here a list might be expected general character basin, and also in

P. edg. analoga (Ortmann).—
 former in the larger, the latter in
 (Lea).—Reported from the Cum-
 In larger rivers in lower and
 Wright).—Headwaters of Powell,
 (Prierson).—Local form in the
caeliata (Lea).—Local form in
 Green Rivers in North Carolina.
 Cumberland drainage in Rockcastle
 of lower, and headwaters of upper
dr. euperatus (Lea).—Cumber-
 the former in the larger rivers, the
 small-river form has not yet been
 Metropolis in Cumberland and
 Tennessee (Mussel Shoals and Paint
 ce only in Chickamauga Creek (near
 River.
 Only in Clinch, Powell, and Emory
 lower Tennessee, Emory River, and
 see; Ortmann, '18 p. 582). Recent-
 been discovered: Emory R., Wart-
ermis (Lea).—Upper Cumberland
 shoals) (rare). Abundant in the
 Tennessee.
 (Lea).—Not rare in Cumberland,
mi (Lea).—Knoxville region of up-
 Walker).—Cumberland River, Burn-
 of the upper Tennessee.
bernaculum (Reeve).—Upper Ten-
 on upward.
 (Lea).—Probably large-river-form
 Cumberland (Burnside) and the
 Tennessee. Not in upper Tennessee.
 elsewhere, as recently reported.

4b. *Dysnomia (Pileca) florentina* (Lea).—The real *florentina* only at
 Mussel Shoals in the lower Tennessee; reported also from Cum-
 berland River, but this should be confirmed.

Finally there is *Actinonaias carinata gibba* (Simpson) in
 the Cumberland, lower and upper Tennessee. But this prob-
 ably is not a typical Cumberlandian form, since it is also found
 in Green River, Ky., that is to say in the Ohio drainage (I have
 collected it myself in the vicinity of Mammoth Cave).

This completes the list of "Cumberlandian" Naiades, as far
 as I am able to make it out. Of the 45 forms enumerated
 above we may be tolerably sure, that their "center of origin"
 is in the Cumberland region, or some portion of it, for the
 reason, that at present they are restricted to it. Twenty-four
 species out of the 45 are found in Duck River, that is a little
 over half of them, 53%.

But it is quite probable, that there are other forms, which
 have their original home in this region; yet they have subse-
 quently dispersed into other parts, chiefly into the Ohio system
 and the interior basin in general. I shall make no attempt
 here to single them out, because of the difficulty connected with
 this task.

No faunistic study is complete, unless it also discusses those
 forms which possibly might be present, *but have not been*
found. It is clear, that it is difficult to positively assert, that a
 species is missing in a given region, simply because it has not
 been found: this may be due to accident. But when it con-
 cerns widely distributed, well-known, and easily recognizable
 forms, the argument of them not having been seen, attains
 greater force. As has been mentioned, the gravel bars of Duck
 River are thickly covered with dead shells. I made it a point
 to examine also these dead shells, and several species reported
 in the above list have been found only in this condition. Yet
 there are others, familiar to me, which I have never seen. I
 give here a list of the more important ones, chiefly such as
 might be expected in Duck River according to its size and
 general character. All these are species found in the interior
 basin, and also in the Cumberlandian region. (The Cumber-

landian types missing in the Duck are given above, Nos. 25 to 45).

Cumberlandia monodonta (Say).—Generally a rare form, frequent only in upper Tennessee. This might yet be discovered in the Duck.

Fusconaia subrotunda (Lea), and related forms.—The absence of such forms in Duck River is very striking: I have seen no trace of them.

Fusconaia flava (Rafinesque), and related forms.—Although represented in Cumberland River, and replaced, in the Tennessee by the *cuneolus* and *edgariana*-types, no trace of this group has been seen in the Duck.

Quadrula metanevra (Rafinesque).—A species easily recognized, but not seen by myself.

Plethobasus cooperianus (Green) and *Pl. cyphus* (Rafinesque).—The genus *Plethobasus* is altogether missing.

Obovaria olivaria (Rafinesque).—Not seen.

Lampsilis orbiculata (Hildreth).—Not seen; the latter two species are rather rare, at least in the Tennessee.

Dysnomia sulcata (Lea).—An Ohio-form, going into the Cumberland and lower Tennessee (Mussel Shoals). Not seen in Duck.

Dysnomia torulosa (Rafinesque) (probably including *D. propinqua* (Lea)).—In the lower Ohio drainage and in the Tennessee, up to the Knoxville region, but not known from Cumberland. Not seen in Duck River.

These forms missing in Duck River, are mostly known to be large-river-forms, some of them also entering smaller streams. Of the Cumberland types, missing in Duck River, (Nos. 25 to 45), again several are large-river-types (*Fusconaia cuneolus appressa*, *Fusc. edgariana*, *Fusc. barnesiana tumescens*, *Dromus dromas*, *Dysnomia haysiana*, *Dysn. biemarginata*, *Dysn. florentina*) while of the Cumberland types present in the Duck, the majority distinctly prefers small streams (*Fusconaia barnesiana bigbyensis*, *Lexingtonia dolabelloides conradi*, *Pleurobema oviforme argenteum*, *Lasmigona holstonia*, *Alasmidonta minor*, *Ptychobranchnus subtentum*, *Caruculina moesta*, *Car. cylindrella*, *Conradilla caelata*, *Medionidus conradicus*, *Micro-myia nebulosa*, *Micr. taeniata*, *Micr. vanuxemensis*, *Dysnomia lenior*, *Dysn. turgidula*, *Dysn. florentina walkeri*.)

Typical small-river-forms of the interior basin, found in Duck River, are few: *Obovaria subrotunda lens* and *Lampsilis ovata ventricosa* could be named. (*Anodonta grandis* also be-

longs here, but this laws of dispersal.)

Thus it is seen, the mingling of two elements, the Cumberlandian type to the interior basin of large-river-types, the Cumberlandian type at Ben. Treville, 0%; at Ben. wick, 33%; L. Hard, 44%; Normandy, 81%; Riverside, 61%; than Shelbyville, the

It appears that the fauna of Duck River is an invasion of the river by important elements of the Duck River. In the farther down, the part does not belong

From these facts the Duck River originally Cumberland and Tennessee small river. Later on direct connection with the lower Tennessee, which, of course, means, I am not going that part of it, which River, and the direct I have just said: it is connected, with both

At the present time the Naiaid fauna is marked per Cumberland, the the Mussel Shoals, but Duck, and probably at some point below the ascertained.)

are given above, Nos. 25

longs here, but this species is subject, apparently, to peculiar laws of dispersal.)

Thus it is seen, that Duck River has a *mixed fauna*, consisting of two elements: a *small-river-fauna*, composed largely of *Cumberlandian types* (about 38%), and an element belonging to the *interior basin* (about 62%); the latter consists chiefly of *large-river-types*. This is also shown in the percentage of *Cumberlandian types* present at the various stations: at Centreville, 0%; at Ben, 11%; at and above Columbia, 31%; Leftwich, 33%; Lillard's Mills, 30%; Wilhoite, 36%; Shelbyville, 11%; Normandy, 86%; Coffee County, 100%; Manchester, 100%; Riverside, 63%; Wartrace, 43% (the latter higher than Shelbyville, the next station below).

It appears that the *Cumberlandian fauna is the original fauna of Duck River*, while the *interior-basin-fauna* is a later invasion of the river, coming up from the lower parts; yet important elements of the interior fauna have not yet reached Duck River. In the lower Duck, at Centreville, and probably farther down, the interior fauna alone is present, and *this part does not belong to the Cumberlandian region*:

From these facts we may derive the following conclusion. *Duck River originally was more directly connected with the Cumberland and Tennessee, and, at that time, it was a rather small river. Later on, it was brought into closer and more direct connection with the interior basin, probably with the help of the lower Tennessee in western Tennessee and Kentucky*, which, of course, means a *change in the direction of the drainage*. I am not going into the details of this question, chiefly that part of it, which concerns the old connections of Duck River, and the direction of its flow, except that I repeat, what I have just said: *it must have been more closely and directly connected, with both Cumberland and Tennessee*.

At the present time, the *distribution of the Cumberlandian Naiad fauna is markedly discontinuous*, being found in the upper Cumberland, the upper Duck, and the Tennessee above the Mussel Shoals, but *not in the lower Cumberland, the lower Duck, and probably also the lower Tennessee* (downward from some point below the Mussel Shoals, which has not yet been ascertained.)

usually a rare form, frequent
be discovered in the Duck.

forms.—The absence of such
have seen no trace of them.

ated forms.—Although repre-
ed, in the Tennessee by the
t this group has been seen in

species easily recognized, but

H. cyphus (Rafinesque).—The

seen.

seen; the latter two species

in, going into the Cumberland
Not seen in Duck.

ably including *D. propinqua*
in the Tennessee, up to the
Cumberland. Not seen in Duck

er, are mostly known to be
entering smaller streams.

in Duck River, (Nos. 25 to

types (*Fusconia cuneolus*

bernesiana tumescens, *Dro-*

Dysn. biemarginata, *Dysn.*

types present in the Duck,

in streams (*Fusconia bar-*

labelloides conradi, *Pleuro-*

ona holstonia, *Alasmidonta*

, *Caruculina moesta*, *Car.*

bolivius conradicus, *Micro-*

vanucemensis, *Dysnomia*

alina walkeri.)

interior basin, found in

rotunda lens and *Lampsilis*

Anodonta grandis also be-

The present paper has been published with the purpose of furnishing material for the solution of the above question, which is intimately connected with the general problem of the history of the Tennessee-Cumberland systems, and their relation to the adjoining drainages, chiefly also that of the Alabama River. My first contribution toward this aim is the paper on the upper Tennessee shells, frequently referred to above, and additional material will be found in the series of papers on Naiades from the Gulf drainage, published recently in the "Nautilus" (Naut. 35. '23 p. 73 ff., p. 129 ff., and 37, '23 p. 56 ff.).

Carnegie Museum.

The American

PUBLISHED
OF NO.

VOL. IX.

The I

C

IV.—SPECIAL TABLES

SPRING MIGRATIONS

Name of Bird

Pied-billed Grebe
Black Tern
Forster's Tern
Canada Goose
Bittern
Least Bittern
Great Blue Heron
Little Green Heron
Black-crowned Night Heron
Virginia Rail
Ron
Florida Gallinule
Coot
Woodcock
Wilson's Snipe
Little Blue Heron (?)
Yellowlegs
Greater Yellowlegs
Upland Plover
Spotted Sandpiper
Killdeer
Mourning Dove
Marsh Hawk
Sharp-shinned Hawk
Cosper's Hawk
Red-tailed Hawk
Red-shouldered Hawk
Broad-winged Hawk
Pigeon Hawk