without encountering a male. All of these observations reinforce the significance of the studies of Norman Mattox, who indicated that the *Campeloma* throughout the northern regions of the United States is parthenogenetic.

While the anatomy of *Campeloma* has been known since 1865 when R. E. Call figured both male and female genital systems, good figures of male genitalia are difficult to find. One of the best was published by F. C. Baker (1928) for *Campeloma integrum*. It was this figure which served to convince local parasitologists in the late thirties and early forties, while they were working with a common metacercarium of *Leucochloridiomorpha constantiae* Mueller in the uterus of *Campeloma*, that this genus does have species with males. However, among the many thousands of specimens they examined they never found one. The figures which were shown at the recent meetings to illustrate the gross anatomy of *Campeloma ponderosum coarctatum* (Lea) will be published later.

Among the males examined it was of interest to find that the verges were by no means similar. In the forthcoming publication several of them will be illustrated to show this wide range of variation. It has recently become a matter of concern that among the specimens studied and labeled as females on the basis of the normal structure of the right tentacle, some of them when sectioned turned out to have the gonads of males. While the modification of the right tentacle to serve as a verge is definite, the question as to its value in species differentiation remains an open question. Serial sections of females show a large storage sac, presumably a spermatheca, filled with sperm, indicating that transfer is successfully accomplished. At present, specimens with normal right tentacles are being sectioned to determine whether there are males without the usual enlarged right tentacle which serves as a verge.

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(A few slides picturing locality, then a projected map and anatomical drawings illustrated this paper.)

Morrison: "Is is possible you may have some *Campeloma crassa* mixed in there?" Van der Schalie: "It may be, but we went under the assumption that all were *ponderosa*; it's really very hard to distinguish since the characteristics are so variable."

THE MUSSEL (MUSCLE) SHOALS OF THE TENNESSEE RIVER REVISITED. David H. Stansbery, The Ohio State Museum, and The Ohio State University, Columbus, Ohio.

(Abstract)

The Mussel Shoals of the Tennessee River, now inundated behind Wilson Dam, have long been famous for the abundance and especially the variety of naiads living there. Ortmann (1924) noted that "there is no other place upon the whole wide world which could be compared with this one in this respect" and he later (1925) listed 69 species and varieties as positively identified from this locality. This remarkable assemblage is apparently due to the coming together of the Cumberlandian Fauna from the Southern Appalachians with the Ohioan Fauna from the Interior Basin in a very favorable environment.

Using today's nomenclature, ignoring subspecies of the same species, and adding one species not included by Ortmann, the list contains 22 Cumberlandian, 15 Ohioan, and 26 unassigned species—63 species in all.

Extensive collecting of the lower Mussel Shoals region below Wilson Dam during August 1963, has made possible a comparison of the original naiad fauna with that of today.

The Naiad Fauna of the Mussel Shoals of the Tennessee River of Northern Alabama

C—Cumberlandian origin P—Previously recorded (Ortmann, 1925)
O—Ohioan origin R—Recently recorded (Stansbery, 1963)
U—Undetermined origin

		Origin	Recorded
1.	*Cumberlandia monodonta* (Say)	U	P
2.	*Fusconaia ebena* (Lea)	O	P, R
3.	*Fusconaia subrotunda* (Lea)	U	P, R
4.	*Fusconaia cuneolus* (Lea)	C	P
5.	*Fusconaia edgariana* (Lea)	C	P
6.	*Fusconaia barnesiana* (Lea)	C	P
7.	*Megalonaias gigantea* (Barnes)	O	P, R
8.	*Amblema plicata* (Say)	U	P, R
9.	*Quadrula quadrula* (Rafinesque)	O	P, R
10.	*Quadrula pustulosa* (Lea)	U	P, R
11.	*Quadrula cylindrica* (Say)	U	P
12.	*Quadrula metanevra* (Rafinesque)	O	P, R
13.	*Quadrula intermedia* (Conrad)	C	P
14.	*Tritogonia verrucosa* (Rafinesque)	U	P, R
15.	*Cyclonaias tuberculata* (Rafinesque)	U	P, R
16.	*Plethobasus cyphyus* (Rafinesque)	U	P, R
17.	*Plethobasus cooperianus* (Lea)	O	R
18.	*Plethobasus cicatricosus* (Say)	O	R
19.	*Lexingtonia dolabelloides* (Lea)	O	R
20.	*Pleurobema cordatum* (Rafinesque)	U	P, R
21.	*Pleurobema clava* (Lamarck)	O	P
22.	*Pleurobema oviforme* (Conrad)	C	P, R
23.	*Elliptio crassidens* (Lamarck)	U	P, R
24.	*Elliptio dilatatus* (Rafinesque)	U	P, R
25.	*Lastena lata* (Rafinesque)	U	P
26.	*Lasmigona costata* (Rafinesque)	U	P
27.	*Anodonta grandis* Say	O	R

28.	*Anodonta suborbiculata* Say	O	R
29.	*Strophitus undulatus* (Say)	U	P
30.	*Ptychobranchus fasciolaris* (Rafinesque)	U	P, R
31.	*Ptychobranchus subtentum* (Say)	C	P
32.	*Obliquaria reflexa* Rafinesque	U	P, R
33.	*Cyprogenia irrorata* (Lea)	U	P, R
34.	*Dromus dromas* (Lea)	C	P
35.	*Obovaria retusa* (Lamarck)	O	P
36.	*Obovaria olivaria* (Rafinesque)	O	P, R
37.	*Actinonaias carinata* (Barnes)	U	P
38.	*Actinonaias pectorosa* (Conrad)	C	P
39.	*Truncilla truncata* Rafinesque	O	P
40.	*Truncilla donaciformis* (Lea)	O	P
41.	*Plagiola lineolata* (Rafinesque)	O	P, R
42.	*Leptodea leptodon* (Rafinesque)	U	P
43.	*Leptodea fragilis* (Rafinesque)	U	P
44.	*Proptera alata* (Say)	U	P, R
45.	*Proptera laevissima* (Lea)	O	R
46.	*Conradilla caelata* (Conrad)	C	P
47.	*Medionidus conradicus* (Lea)	C	P
48.	*Villosa trabilis* (Conrad)	C	P
49.	*Villosa nebulosa* (Conrad)	C	P
50.	*Villosa taeniata* (Conrad)	C	P
51.	*Villosa vanuxemensis* (Lea)	C	P
52.	*Ligumia recta* (Lamarck)	U	P, R
53.	*Lampsilis virescens* (Lea)	C	P
54.	*Lampsilis anodontoides* (Lea)	O	P, R
55.	*Lampsilis ovata* (Say)	U	P, R
56.	*Lampsilis fasciola* Rafinesque	U	P
57.	*Lampsilis orbiculata* (Hildreth)	O	P, R
58.	*Dysnomia triquetra* (Rafinesque)	U	P
59.	*Dysnomia brevidens* (Lea)	C	P
60.	*Dysnomia sulcata* (Lea)	O	P
61.	*Dysnomia haysiana* (Lea)	C	P
62.	*Dysnomia personata* (Say)	O	P
63.	*Dysnomia biemarginata* (Lea)	C	P
64.	*Dysnomia turgidula* (Lea)	C	P
65.	*Dysnomia florentina* (Lea)	C	P
66.	*Dysnomia capsaeformis* (Lea)	C	P
67.	*Dysnomia torulosa* (Rafinesque)	U	P
68.	*Dysnomia arcaeformis* (Lea)	C	P*

* Omitted by Ortmann (1925).

Summary

	Previously recorded	Recently recorded
Cumberlandian species	22	2
Ohioan species	15	14
Unassigned species	26	14
	63	30

There seems little doubt but that the Cumberlandian species are the most susceptible to the changes which have occurred and that the Ohioan species are the most resistant.

The only two Cumberlandian species recently taken are represented by only two specimens each. If these specimens are, as seems highly probable, chance introductions into the area, then there are today no reproducing populations of any Cumberlandian species in the Mussel Shoals area. It appears that Ortmann's concern that this unique fauna might gradually disappear with the effect of the dam and increased pollution is being rapidly realized.

(Accompanied by slides showing habitat, John boats, Indian middens, etc.)

Clench: "Have you made analysis as to shoal vs. deep-water species?" Stansbery: "Yes, and found the shallow-water species mainly gone, the deep-water species living still." Clench: "Also, I imagine the fish hosts are gone. In 1840 when Anthony made his famous trip the Indians used to cross the river where the dam is today."

CYTOTAXONOMY OF THE GENUS *ONCOMELANIA*, INTERMEDIATE HOST OF *SCHISTOSOMA JAPONICA*.[1, 2] John B. Burch, Museum and Department of Zoology, University of Michigan, Ann Arbor, Michigan.

(Abstract)

There have been several different and quite diverse opinions concerning systematics of the snail vectors of Oriental human schistosomiasis, and especially the number of taxa which comprise the group. The most extreme view to the side of the "splitters" is that of Bartsch (1936, 1939, 1946), where the genus *Oncomelania* of other authors was divided into three genera, *Oncomelania* retained for *O. hupensis* Gredler, and including *O. möellendorffi*, *O. longiscata*, *O. elongata*, *O. schmackeri*, *O. multicosta*, *O. costulata*, *O. crassa*, and *O. yaoi*; the genus *Katayama* retained for *Katayama nosophora* Robson, and including "*Katayama*" *nosophora yoshidae*, "*K.*" *formosana*, "*K.*" *lii*, "*K.*" *fausti*, "*K.*" *cantoni*, and "*K.*" *tangi*; and the genus *Schistosomophora* described as a new taxon to include *Prososthenia quadrasi* Möellendorff and "*S.*" *minima*, "*S.*" *robertsoni*, and "*S.*" *slatteri*. In this scheme, the vectors of Oriental schistosomiasis and allied species consisted of 3 genera, 19 species, and 2 subspecies.

Abbott (1948) considered the group to consist of only one genus, *Oncomelania*, and this genus to contain only four species, one of which had an additional variety, *O. hupensis slatteri*. *Oncomelania nosophora* was believed to occur in Japan and the China mainland; *O. hupensis* inhabited the China mainland; *O. formosana* was found on Formosa; and *O. quadrasi* was found in the Philippines. Yuan-Hua and Shou-Pai (1957) went even further and presented the opinion that ". . . the specific term *Oncomelania hupensis* Gredler should be used for all *Oncomelania* snails involved in the transmission

[1] Contribution No. 4, Intermediate Hosts of Schistosomiasis Program, Institute of Malacology. This work was done in cooperation with the 406 Medical Laboratory, U. S. Army Medical Command, Japan.

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