Banisteria, Number 40, pages 73-74

A VIRGINIA POPULATION OF *ALASMIDONTA TRIANGULATA* (LEA)? (BIVALVIA: UNIONIDAE). -- Walking the shoreline of Buggs Island Lake at Oconeechee State Park, Mecklenburg Co., Virginia, in the fall of 1988, I found some mussel shells that were totally new to my experience. Reference to Johnson's (1970) synopsis of the Unionidae of the "Southern Atlantic Slope" provided an immediate identification: the specimens matched precisely the verbal account and photographs of a species treated under the name *Alasmidonta triangulata* (Lea).

However, granting this identification as reasonably correct only engendered a series of contingent problems. Described as *Margaritana triangulata* by Isaac Lea (1858) from specimens taken in the upper Chattahoochee River, Georgia, the species – *sensu* Johnson (1970) – seems to be both local and uncommon. Johnson could provide only a few collection records each for the Apalachicola, Ogeechee, Savannah, and Santee river systems of Georgia and South Carolina. Nor have more recent investigations revealed the species in the Atlantic drainage basins of North Carolina.

Aside from the biogeographic problem, a more substantive issue was raised by A. H. Clarke who, in his 1981 revision of *Alasmidonta* seriously challenged the status of *A. triangulata* as a valid species. An additional question is thus added to the foregoing list: is the characteristic shell shape (very large and obese, with large, elevated umbones; Fig. 1) only an ecophenotypic expression related to life in slow or still water of reduced oxygen content? Clarke (1981) went to some lengths to identify correlations between various environmental factors and shell form in the range of what he considered to be *A. undulata* (Say), and concluded that the traits attributed by previous authors to the nominal species *A. triangulata* only reflected geographic gradients from north to south and that the validity of that name could not be defended.

Alasmidonta undulata is widespread in south central Virginia as well as adjacent North Carolina (whence the Virginia Museum of Natural History [VMNH] received numerous samples from John M. Alderman). Mature specimens from the Chowan and Tar river systems (which thus bracketed the Virginia locality for "*triangulata*") differ slightly in shell form from more northern populations, but scarcely approach the facies of the Buggs Island Lake form, as might be expected if the latter was the product of geographic morphometric clines or trends. However, specimens in a series of 13 (VMNH 66) from the Little River in Johnston Co.,

Fig. 1. Large adult of *Alasmidonta triangulata* (Lea), from Buggs Island Lake at Staunton River State Park, Halifax Co., Virginia (VMNH 1470.3). Length = 78 mm.

North Carolina, show marked increase in umbonal size and could readily be construed as intermediate in shell characters between the two forms, but subjectively closer to *A. triangulata.* That these mussels were taken from a small, flowing stream opposes the view that the obese shell form with high umbonal region represents only an ecophenotype adapted to still waters with low oxygen content. Clearly, the last word has not been written regarding the status of the three names *A. undulata*, *A. triangulata*, and *A. arcula* (Lea). For the present, I am inclined to the view that *A. triangulata* merits at least provisional recognition, an opinion shared by Dr. David H. Stansbery (pers. comm., following examination of Buggs Island Lake shells). Examination of soft-part structure is obviously a prerequisite for reliable identification, as well as an analysis of molecular genetic similarities.

VMNH has samples of shells with the following data: **Mecklenburg Co.**: Buggs Island Lake, inlet between Campground A, Oconeechee State Park and the boat ramp, 23 September 1988 (VMNH 56), 18 October 1988 (VMNH 58), 10 March 1990 (VMNH

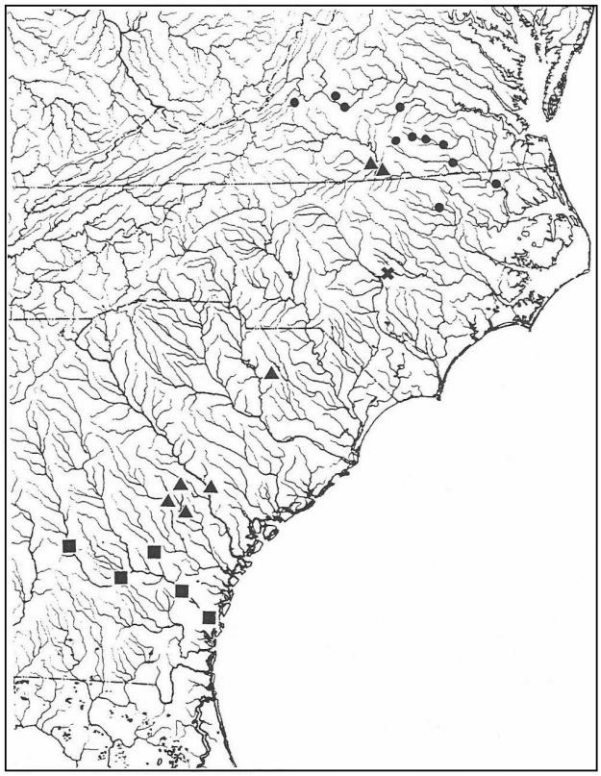

Fig. 2. Southeastern United States, with distributional records for *Alasmidonta triangulata* (triangles), *A. undulata* (dots), and *A. arcula* (squares). An intermediate population in the Little River, Johnston Co., North Carolina, is represented by the "X". Localities for *A. undulata* are from VMNH material; there are apparently no records for the species in the Roanoke River system.

1152), 3 January 1997 (VMNH 1436), and 18 December 1997 (VMNH 2046), all RLH leg.; **Halifax Co.**: Staunton River State Park, at confluence of Staunton (Roanoke) and Dan rivers, 9 November 1998, S. M. Roble and A. C. Chazal (VMNH 1470); also 150 m upstream of the previous site on the Staunton River side, 22 October 1997, A. Belden (VMNH 2048). These localities are about 13.5 km/8 mi apart, and imply that numerous additional population sites remain to be identified in Buggs Island Lake. Recovery of this mussel in the flowing reaches of the Dan and/or Roanoke rivers would provide further insight into the taxonomic status of this population. It is regrettable that no pre-impoundment material was ever taken from the Roanoke River. Since information about the genetic characters of the *undulata* group of *Alasmidonta* may offer the only hope for resolution of the status of *A. triangulata*, the location of a population of accessible individuals is much to be desired.

A brief summary of the distribution of the three species mentioned here may be of interest. The map (Fig. 2) is based largely on the records of Johnson (1970), since Clarke (1981) did not distinguish *A. triangulata*. Not having examined the material that Johnson listed from the Apalachicola River system, I do not know if it is referable to *A. triangulata*, but would suspect this to be the case inasmuch as the type locality of that name is "upper Chattahoochee River" (Lea, 1858), and since Johnson (1970) stated that the shell attains a length of 70 mm in the Apalachicola system. This would imply a range across the inner Coastal Plain of Georgia. *Alasmidonta arcula*, which was accepted as a valid species by Clarke (1981), appears to be endemic to the Altamaha River system (Fig. 2, squares), thus allopatric with *A. triangulata* in the south.

There seems to be little doubt that the *Alasmidonta* population in Buggs Island Lake is conspecific with those farther south. Whether it is native or unintentionally introduced remains to be determined. Inquiry of the Virginia Department of Game and Inland Fisheries disclosed that that agency has not stocked Buggs Island Lake with any fish from South Carolina or Georgia. However, the possibility of unintentional introduction of glochidia-infected hosts by fishermen cannot be excluded.

The presence of at least one population, intermediate with *A. undulata*, in eastern North Carolina also introduces the possibility that all three of the nominal species discussed herein may prove to be distinct geographic races.

LITERATURE CITED

Clarke, A. R. 1981. The tribe Alasmidontini (Unionidae: Anodontinae). Part I. *Pegias*, *Alasmidonta*, and *Arcidens*. Smithsonian Contributions to Zoology 326: 1-101.

Johnson, R. I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalvia) of the Southern Atlantic Slope Region. Bulletin of the Museum of Comparative Zoology 140: 263-450.

Lea, I. 1858. Descriptions of seven new species of Margaritanae and four new species of Anodontae. Proceedings of the Academy of Natural Sciences of Philadelphia for 1858: 138-139.

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Banisteria, Number 41, pages 99-100

RE-IDENTIFICATION OF *ALASMIDONTA TRIANGULATA* FROM VIRGINIA. - The late Richard Hoffman recently published a paper on the identification of specimens collected in 1988 as *Alasmidonta triangulata* (Lea, 1858) from Halifax and Mecklenburg counties, Virginia (Hoffman, 2012). Both collection sites are located in the Roanoke River basin. Johnson (1970) recognized *A. triangulata* as a valid species occurring in the Ogeechee, Savannah, and Wateree River drainages of the South Atlantic slope. Hoffman (2012) reported that Clarke (1981) had examined the clinal increase in shell inflation of *Alasmidonta undulata* (Say, 1817) from Maine to South Carolina and considered *A. triangulata* to be a local variant and junior synonym of *A. undulata*.

The taxa discussed here are: *Alasmidonta undulata*, type locality is the Delaware and Schuylkill rivers [near Philadelphia, Philadelphia Co., Pennsylvania] (Johnson,

1970: 349; Clarke, 1981: 38); *Alasmidonta arcula* (Lea, 1838), type locality is the Altamaha [River], Liberty [now Long] County, Georgia (Johnson, 1970: 352; Clarke, 1981: 48); *Alasmidonta triangulata* (Lea, 1858), type locality is the Upper Chattahoochee [River], Georgia (Johnson, 1970: 351; Clarke, 1981: 38; Williams et al., 2008).

Bogan et al. (2008) reviewed the phylogenetic relationships of all extant species referred to the genus *Alasmidonta*. This genus is restricted to the eastern United States and currently contains 12 species (Clarke, 1981; Turgeon et al., 1998; Williams et al., 2008). *Alasmidonta* is divided into two subgenera, *A.* (*Alasmidonta*) is restricted to the rivers of the Atlantic Slope and *A.* (*Decurambis*) to the Mississippi River basin and the Gulf Coast (Bogan et al., 2008; Williams et al., 2008).

Analyses performed by Bogan et al. (2008) support recognizing as valid species: *A. arcula*, *A. undulata* extending from Maine to South Carolina, and *A. triangulata* restricted to the Chattahoochee River basin (Brim Box & Williams, 2000; Williams et al., 2008, 2011). Populations reported as *A. triangulata* by Hoffman (2012) from the Ogeechee River, Georgia, were identified by Bogan et al. (2008) as *A. arcula*.

The results of the genetic analyses do not support the identification of the Virginia specimens as *A. triangulata* or the occurrence of that species in Atlantic Slope rivers. This work, combined with the observations of Clarke (1981) on the clinal variation of the shell inflation and thickness, supports the identification of the Virginia specimens as *A. undulata*. Five Virginia Museum of Natural History lots of *A. triangulata* collected by Hoffman from Halifax and Mecklenburg counties were examined and re-identified as *A. undulata*. The identification of *A. triangulata* in southern Virginia, based on shell shape (Hoffman, 2012), is a misidentification.

LITERATURE CITED

Bogan, A. E., M. E. Raley, Y. Huang, & J. Levine. 2008. Intraspecific phylogenetic relationships in the freshwater bivalve genus *Alasmidonta* (Bivalvia: Unionidae). Unpublished report to North Carolina Department of Transportation (Project Number: HWY-0754). 9 February 2008. 31 pp.

Brim Box, J., & J. D. Williams. 2000. Unionid mollusks of the Apalachicola Basin in Alabama, Florida, and Georgia. Alabama Museum of Natural History Bulletin 21: 1-143.

Clarke, A. H. 1981. The tribe Alasmidontini (Unionidae: Anodontinae), Part I. *Pegias*, *Alasmidonta*, and *Arcidens*. Smithsonian Contributions to Zoology. No. 326. 101 pp.

Hoffman, R. L. 2012. A Virginia population of *Alasmidonta triangulata* (Lea) (Bivalvia: Unionidae)? Banisteria 40: 73-74.

Johnson, R. I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalvia) of the southern Atlantic Slope Region. Bulletin of the Museum of Comparative Zoology 140: 263-450.

Turgeon, D. D., J. F. Quinn, A. E. Bogan, E. V. Coan, F. G. Hochberg, W. G. Lyons, P. Mikkelsen, R. J. Neves, C. F. E. Roper, G. Rosenberg, B. Roth, A. Scheltema, F. G. Thompson, M. Vecchione, & J. D. Williams. 1998. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks. Second Edition. American Fisheries Society, Special Publication 26. 526 pp.

Williams, J. D., A. E. Bogan, & J. T. Garner. 2008. Freshwater Mussels of Alabama and the Mobile Basin in Georgia, Mississippi and Tennessee. University of Alabama Press, Tuscaloosa. 908 pp.

Williams, J. D., R. S. Butler, & J. M. Wisniewski. 2011. Annotated synonymy of the Recent freshwater mussel taxa of the families Margaritiferidae and Unionidae described from Florida and drainages contiguous with Alabama and Georgia. Bulletin Florida Museum of Natural History 51: 1-84.

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