Gordon Kraemer 1984

LAMPSILIS REEVEIANA AND *LAMPSILIS STRECKERI* (BIVALVIA: UNIONACEA): SOME CLARIFICATION. – Classification of *Lampsilis reeveiana* (Lea, 1852) (junior synonyms: *Unio breviculus* Call and *L. brittsi* Simpson) has been confused since its original description when Lea published the collector's address (Dr. J. Hale, Alexandria, Louisiana) rather than the type locality: "White River, Arkansas" penciled inside the allotype USNM 85025a[1] (Gordon, 1980; Johnson, 1980). Simpson (1914) listed it as both *L. (L.) brevicula* and *L. (Eurynia) reeveiana*. Utterback (1916) considered it *E. (Micromya)*, now known as *Villosa*, although he described a *Lampsilis*' anatomy for *E. (M.) brevicula* and treated *L. reeveiana* as a separate species. Ortmann (1918) placed the species (as *brevicula*) in *Lampsilis*, while Frierson (1927) relegated it to the subgenus *Ligumia* under *Lampsilis*. Recently, Burch (1975) and Johnson (1980) retained it in *Villosa*.

A major diagnostic criterion for *Lampsilis* is the presence of a mantle flap anterior to the branchial siphon in females. This is an extension of the inner lobe of the mantle edge and occurs rudimentarily in males. In *Villosa*, this area of the female is developed as a series of variably shaped and spaced papillae and is also rudimentary in males (Ortmann, 1912). Females of both genera exhibit pulsating contractions of this region (flapping behavior) prior to glochidial discharge. Utterback (1916) noted a mantle flap in his anatomical description of *Eurynia (Micromya) brevicula*. Ortmann (1918, as *brevicula*) and Kraemer (1970, as *brevicula brittsi*) confirmed the presence of the mantle flap and noted a close anatomical relationship to *L. radiata siliquoidea* (Barnes). Kraemer (1970) also noted a behavioral repertoire close to this species. Mantle flap morphology and spawning behavior are summarized in Table 1 for *reeveiana* and two *Lampsilis* species commonly sympatric with it. From the above, it is evident that *reeveiana* is a *Lampsilis*.

TABLE 1. Morphology of mantle flaps and spawning behavior for living *Lampsilis reeveiana, L. radiata siliquoidea* and *L. ventricosa*.

Characteristic	*L. reeveiana*	*L. radiata siliquoidea*	*L. ventricosa*
Eyespots	Inconspicuous, usually apparent on outside of flap only	Inconspicuous, apparent on outside and inside of flap	Conspicuous, apparent on outside of flap only
Flap pigmentation	Uniform, dark gray on outer surface	Variegated, many pigment spots on outer surface	Uniform gray on outer surface
	Conspicuous, large pigment spot near "tail" of each mantle flap	Conspicuous pigment spot near the base of "tail" of each mantle flap	No pigment spot
"Tail" of the mantle flap	5-10 long papillae attached to "tail" provide flaps with flaring appearance	10-20 long papillae attached to "tail" and its base provide flap with fringed, flaring appearance	Narrow, tapered "tail"
Maximal rate of flapping	17-20 pulses per minute	17-20 pulses per minute	Up to 3 pulses per second
Typical angle of orientation to substrate during flapping behavior	45° or less	45° or less	Commonly up to 90°
Environmental stimuli which evoke modifications of flapping behavior	Mechanical disturbance of substrate or water column	Mechanical disturbance of substrate or water column	Increments or decrements of low intensity light

Lampsilis reeveiana is endemic to north and south slopes of the Ozark Plateaus (Gordon, 1980; Gordon et al., 1980; Johnson, 1980). This includes the Osage, Gasconade and Meramec river systems of the north slope and the White River basin of the south slope. It is not present in the west slope drainages of the Illinois River or tributaries of the Neosho River (Gordon & Brown, 1981), although it appears to be replaced in these streams by *L. rafinesqueana* Frierson. Restriction of *L. reeveiana* to the Ozark Plateaus suggests a relict species (Gordon, 1981). This is supported by the geologic age of the uplift and endemism (Gordon et al., 1980). Except for *L. radiata siliquoidea*, there appears to be no morphologically similar, extant *Lampsilis* north of the southern limit of glaciation or within the Tennessee-Cumberland basin. Burch (1975), Gordon (1980), Gordon et al. (1980) and Johnson (1980) noted an association between *L. reeveiana* and *L. streckeri* Frierson. Johnson (1980) synonymized *L. streckeri* as *Villosa vibex* (Conrad) and, as such, contrasted its shell to that of *L. reeveiana* (as *Villosa*). Any relationship between *L. reeveiana* and southeastern *Villosa*, as suggested above, would seem improbable. However, if *streckeri* is a *Lampsilis*, representing some convergence conchologically with *V. vibex*, there is an interesting relationship between the distribution of *L. reeveiana* and other southwestern *Lampsilis* (Gordon et al., 1980).

Johnson (1980) considered the similarity in raying as a criterion for synonymizing *Lampsilis streckeri* as *Villosa vibex*. While *V. vibex* may exhibit broken raying, *L. streckeri* and *L. reeveiana* may develop rays with an inverted chevron pattern. *L. streckeri* exhibits a variably low posterior pseudocardinal similar to *V. vibex*; however, the dentition (particularly pseudocardinals) is not as lamellar. Nacre is grayish with some bluish iridescence posteriorly and tends to be blotched with brown, while *V. vibex* is bluish-white to pink or purple, more iridescent, and tends not to be blotched. Overall, the shell of *L. streckeri* is more similar to *L. reeveiana* than to *V. vibex*. In fact, the types of *L. streckeri* were identified originally as "*Unio reeveiana* Lea" (by W.A. Marsh, labels with UMMZ 91075) as were the Onion Creek specimens (Frierson, 1927; see below). Johnson (1980) seemed to imply that Frierson's types were collected together with *V. vibex* at the same locality. Frierson probably meant they were found cataloged with specimens of *V. vibex*.

Lampsilis streckeri is known only from two localities: Little Red River of the White River system, Arkansas, and Onion Creek, Travis County, Texas, in the Edwards Plateau region. Strecker (1931) listed a third locality (Salado Creek, Bell County, Texas) but the validity of this collection is unknown. These represent upland habitat with rocky

[1] USNM = U.S. National Museum of Natural History; UMMZ = University of Michigan Museum of Zoology.

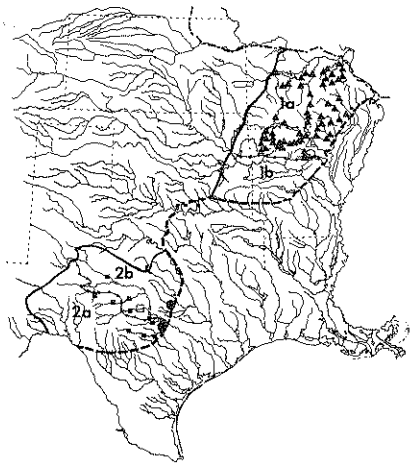

FIG. 1. Geographical range of *Lampsilis reeveiana, L. streckeri* and *L. bracteata* with regard to the Ozarks and Edwards Highlands, limit of maximum glaciation, and limit of Cretaceous embayment. 1, Interior Highlands; a, Ozark Plateaus; b, Ouachita Mountains. 2, Edwards Highlands; a, Edwards Plateau; b, Central Texas Highland.
– - – = Southern limit of glaciation; – – – = limit of Cretaceous-Tertiary embayments by the Gulf of Mexico; ▲ = *L. reeveiana*; ● = *L. streckeri*; ■ = *L. bracteata*. (Open symbols represent the restricted type localities.)

substrates and fairly fast flowing water. Preferred habitat of *Villosa vibex* is mud or soft sand with accumulations of plant detritus (Johnson, 1972), which also implies slower moving water. The upland habitat of *L. streckeri* is in distinct contrast to that of *V. vibex* in the coastal plain. These distributions may be related to habitat modification from the Cretaceous-Tertiary embayments of the Gulf of Mexico (Gordon et al., 1980). *V. vibex* has never been reported from Arkansas (Gordon, 1980; Gordon et al., 1980), and Neck (pers. comm.) believes *Villosa* in Texas is limited to *V. lienosa* (Conrad). It seems probable that *L. streckeri* and *V. vibex* are not conspecific.

An apparent preference for geologic uplifts (Fig. 1) exists. *Lampsilis reeveiana* is endemic to the Ozarks while *L. streckeri* exhibits a disjunct distribution between the Ozarks and Edwards Highlands. Thus, a potential relationship between *L. reeveiana* and southwestern *Lampsilis* (e.g., *L. bracteata* (Gould), type locality here restricted to Llano River, Llano, Llano County, Texas) is possible. There are some morphological similarities among the shells of these species. However, without access to an anatomy of the animal, the true systematic position of *L. streckeri* will never be known. Frierson's (1927) types were collected by Elwood Pleas in 1872 (labels with UMMZ 91075), while the Onion Creek specimens date from Askew (in Singley, 1893; Strecker, 1931). No other confirmed specimens have been collected since. The type locality of *L. streckeri*, here restricted to Little Red River, Clinton, Van Buren County, Arkansas (from Pleas' labels), is now inundated by Greer's Ferry Reservoir, which incorporates hypolimnetic discharge. Neck (pers. comm.) has never seen *L. streckeri* or *Villosa vibex* in Onion Creek, although he has found *L. bracteata*. *L. streckeri* may be extinct*

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LITERATURE CITED. – BURCH, J.B. 1975. *Freshwater unionacean clams (Mollusca: Pelecypoda) of North America*. Malacological Publications, Hamburg, Michigan, U.S.A. 204 pp. – FRIERSON, L.S. 1927. *A classified and annotated check list of the North American naiads.* Baylor University Press, Waco, Texas, U.S.A. 111 pp. – GORDON, M.E. 1980. *Freshwater Mollusca of the Elk River, White River above Beaver Reservoir, and Frog Bayou drainages of the southwestern Ozarks.* M.S. Thesis, University of Arkansas, Fayetteville, U.S.A. 366 pp. – GORDON, M.E. 1981. Recent Mollusca of Arkansas with annotations to systematics and zoogeography. *Proc. Ark. Acad. Sci.*, 34: 58-62. – GORDON, M.E. & BROWN, A.V. 1981. Significant additions to the molluscan fauna of the Illinois River, Arkansas. *Proc. Ark. Acad. Sci.*, 34: 113-114. – GORDON, M.E., KRAEMER, L.R. & BROWN, A.V. 1980. Unionacea of Arkansas: historical review, checklist, and observations on distributional patterns. *Bull. Am. malacol. Union*, 1979: 31-37. – JOHNSON, R.I. 1972. The Unionidae (Mollusca: Bivalvia) of peninsular Florida. *Bull. Fla. State Mus. biol. Sci.*, 16: 181-249. – JOHNSON, R.I. 1980. Zoogeography of North American Unionacea (Mollusca: Bivalvia) north of the maximum Pleistocene glaciation. *Bull. Mus. comp. Zool.*, 149: 77-189. – KRAEMER, L.R. 1970. The mantle flap in three species of *Lampsilis* (Pelecypoda: Unionidae). *Malacologia*, 10: 225-282. – LEA, I. 1852. Descriptions of new species of the family Unionidae. *Trans. Am. philos. Soc.*, 10: 253-294. – ORTMANN, A.E. 1912. Notes upon the families and genera of the najades. *Ann. Carnegie Mus.*, 8: 222-365. – ORTMANN, A.E. 1918. The systematic position of two species of mussels from the Ozarks. *Nautilus*, 32: 13-15. – SIMPSON, C.T. 1914. *A descriptive catalogue of the naiads, or pearly fresh-water mussels.* Bryant Walker, Detroit. 1540 pp. – SINGLEY, J.A. 1893. Contributions to the natural history of Texas: pt. 1, Texas Mollusca. *Geol. Surv. Texas annu. Rep.*, 4: 297-343. – STRECKER, J.D. 1931. The distribution of the naiades or pearly fresh-water mussels of Texas. *Baylor Univ. Mus. spec. Bull.*, 2: 1-71. – UTTERBACK, W.I. 1916. The naiads of Missouri. *Am. midl. Nat.*, 4: 432-464.

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* based on some more material I've recently examined, L. streckeri is probably technically a synonym of L. reeveiana and also includes specimens of L. bracteata (Texas lots). MEG