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OF THE ENDANGERED NAIAD MOLLUSK *LAMPSILIS HIGGINSI*
(LEA, 1857)
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ABSTRACT
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ABSTRACT

A continuing search through literature records and museum specimens reveals that *Lampsilis higginsii* was rare, but widely distributed from Mississippi River Mile 283, Louisiana, MO. to River Mile 811, Prescott, WI (528 miles). By 1965 the northern end of the range was reduced by at least 103 miles, and the southern end by 133 miles, a 45% loss of the range. Based on 1977 through 1980 records, the range has decreased to only 251 miles, a loss of 52.5%. Reproduction to assure continuation of the species is questionable even where populations are known to be established. Records indicate that *L. higginsii* was found in at least 10 major tributaries of the Mississippi River, but at present only small populations are known in the Wisconsin River, WI, and in the St. Croix River, WI and MN. Because of the obvious decrease in range, several areas should be designated as critical habitat. Studies of shells found in animal middens will add to the knowledge of the range and of the variable shell characteristics of this naiad. Little is known about the densities of living *L. higginsii* within the present range.

HISTORIC DISTRIBUTION

In a time span of just over 100 years, the naiad mollusk, *Lampsilis higginsii* (Lea, 1857), has been recorded throughout the Upper Mississippi River from Louisiana, MO. River Mile (R.M.) 283 (Utterback, 1915-1916), to Prescott, WI, R.M. 811 (United States National Museum (USNM), Washington, D.C.) (Fig. 1).

A continuing search of published and unpublished records and museum specimens reveals *Lampsilis higginsii* in over 65 locations prior to 1965. This indicates a former widespread distribution throughout 528 miles of the Upper Mississippi River. Only about a dozen sites are represented by museum or literature records of multiple specimens. Although regarded by most authors as a rare species, *L. higginsii* was suitable enough for the pearl button industry (Coker, 1919).

Prior to 1900, *Lampsilis higginsii* was reported by Tryon (1865), Pratt (1876), Witter (1883), and Shimek (1888), and in the University of Minnesota (collected by Holzinger in 1890). From 1900 until 1931 specimens were reported by Baker (1905, 1926, 1928), Geiser (1910), Coker (1919), Grier (1922, 1926), Grier and Mueller (1922-1923),

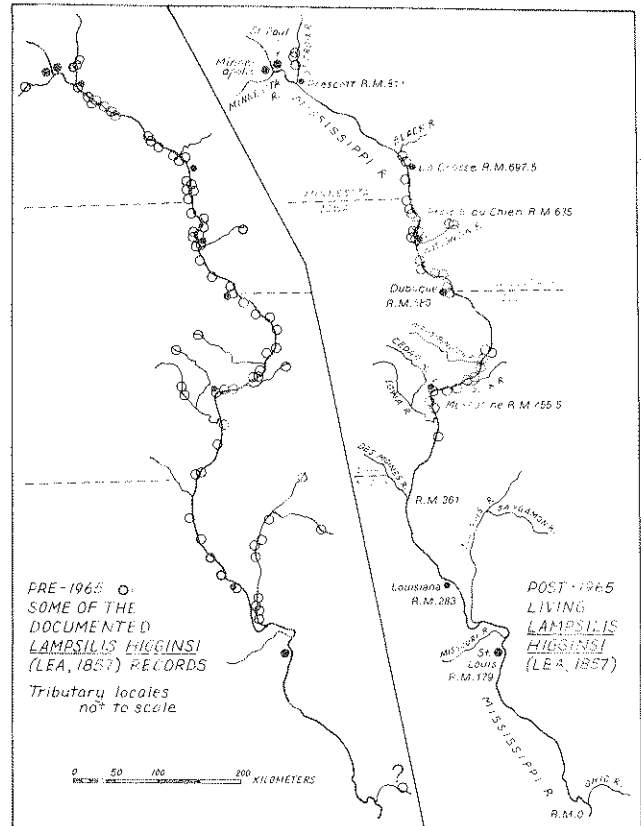


Fig. 1 The distribution of *Lampsilis higginsii* (Lea, 1857) in the Mississippi River and tributaries before and after 1965.

Shimek (1921), and the results of the Ellis survey of 1930 and 1931 were summarized by van der Schalie and van der Schalie (1950). In 1907 Bartsch collected from over 130 sites on the Mississippi and found *L. higginsii* at only 39 sites (USNM). From 1932 until 1965 only Dawley (1947) recorded *L. higginsii*; however, her records were based on older museum records at the University of Minnesota (personal communication, 1975).

Since 1965 living and dead specimens from the Mississippi and

tributaries have been recorded by 1965, 1979, and 1980 Wisconsin Department of Natural Resources surveys (P. Thiel, personal communication, 1980), Havlik (personal collection, 1970 through 1980), Starrett, (1971), Havlik and Stansbery (1977), Fuller (1978), Perry (1979), Mathiak (1979), Nelson and Freitag (1980), and Oblad (1980).

Over 400 dead and 60 living *Lampsilis higginsii* were collected or seen by the author, mainly from the Prairie du Chien, WI, area. Many of the dead specimens are at The Ohio State University Museum of Zoology; most of the live specimens were returned to the river.

MISSISSIPPI TRIBUTARY RECORDS

State of Illinois

Danglade (1914) reported *Lampsilis higginsii* in the Illinois River from Twelve Mile Island to Chillicothe, IL. In 1887 Shimek collected a specimen as far upstream as Morris, IL (USNM), 262 miles from the mouth of the Illinois River. By 1966 only a single sub-fossil valve was found (Starrett, 1971). This species was gradually eliminated by pollution and siltation even before 1930 (Starrett, 1971) and was extirpated from 262 miles of the Illinois River. Baker (1926) was the only one to report *L. higginsii* from the Rock River. The only specimens known from the Sangamon River consist of a growth series of six *L. higginsii* collected in 1886 (Field Museum of Natural History). *L. higginsii* was collected from the Kankakee River (not on map) in eastern Illinois at Lorenzo in 1955 (Illinois State Museum); the status of the species in the Kankakee is unknown today.

State of Iowa

Lampsilis higginsii was reported from the Iowa, Cedar, and Wapsipinicon Rivers in Iowa (Witter, 1883; Shimek, 1888; and Geiser, 1910). Very little has been done on these rivers in recent times and further survey work is recommended (Fuller, personal communication, 1979).

State of Wisconsin

Lampsilis higginsii was reported from the St. Croix River by Dawley (1947) and in 1952 (American Museum of Natural History). The species survives near Hudson, WI, (Fuller, 1978; Science Museum of Minnesota), but the extent of reproduction is unknown (Fuller, personal communication, 1979). Johnson (1980) reported *L. higginsii* from the Wisconsin River, WI (1955), and Mathiak (1979) reported two live specimens at a site 60 miles upstream from the mouth of the Wisconsin River. Bartsch recorded the species from the Black River at La Crosse, WI, in 1907 (USNM); a shell found there in 1978 by the author appeared to have been empty for a long time.

State of Minnesota

One *Lampsilis higginsii* was recorded from the Minnesota River at New Ulm, MN, in 1934 (University of Minnesota; Dawley, 1947). A questionable valve was found near Savage, MN, by the author in 1977. Prospects for any living naiades are unlikely from Savage to the mouth of the Minnesota River, a distance of 15 miles (Fuller, 1978).

Other Records

A record exists of *Lampsilis higginsii* in the Elkhorn River, West Point, NE (USNM), and in the Nemaha River, NE (Aughey, 1877), but the validity is questionable because these specimens were so far out of range.

Lampsilis higginsii has been recorded from several rivers in Arkansas (Wheeler, 1914) and Missouri (Utterback, 1917). Ongoing systematic studies at The Ohio State University Museum of Zoology indicate that specimens from these rivers are a form of the related *L. orbiculata* (Hildreth, 1828) complex (Stansbery, personal communication, 1977); therefore, these site records were not included in Fig. 1.

Lampsilis orbiculata, a more southern species, can usually be distinguished from *L. higginsii* by the lower umbo and lighter periostracum (Wilson and Clark, 1914). Internal anatomical studies show marked differences in the pigmentation and papillae of the incurrent aperture as

well as in the structure and pigmentation of the mantle flap (Stansbery, personal communication, 1977). Only a few of the *L. higginsii* shells examined resembled the original description of *L. orbiculata*; however, the question of *L. orbiculata* living in the Mississippi and Illinois Rivers may never be fully answered unless soft parts of atypical *L. higginsii* are available for study.

There is a 1907 record (USNM) of *L. orbiculata* and *L. higginsii* from the Illinois at Hardin, IL (Starrett, 1971). After examining these two specimens, I realized that both were *L. higginsii* and had eventually been catalogued as such at USNM. Similar records of *L. orbiculata* and *L. higginsii* by Witter (1883), Danglade (1914), and Shimek (1921) may have been in error due to the limited concept of these species at that time.

In 1907 a specimen of *L. higginsii* was taken by Bartsch at Hillerman, IL, on the Ohio River (USNM). The specimen has been examined and the identification is correct. This is either the only known record of *L. higginsii* outside its Upper Mississippi River range, or represents a spurious description of specimen or label.

UPPER MISSISSIPPI RIVER RECORDS SINCE 1965

As of 1965 living *Lampsilis higginsii* range had been greatly reduced from Mississippi R.M. 283 to R.M. 416, Oquawka, IL, on the southern end of the river, and from R.M. 811 down to R.M. 708, just above La Crosse, WI, on the northern end, a 45% loss. This left a range of 292 miles (Fig. 1). The records at both ends of this range are, however, 15 years old. Studies from 1977 through 1980 indicate that the northern end of the range is at Brownsville, MN, R.M. 689, and the southern end of the range is at R.M. 437, a further loss of 41 miles. The recent range of *L. higginsii*, as determined by the collection of living specimens, is only 251 miles, a loss of 277 miles of habitable river (52.5%). This range is less than the range formerly known in one tributary, the Illinois River: *L. higginsii* was extirpated from that river in about 40 years. The 1977 through 1980 data reveals no live *L. higginsii* from R.M. 510 to Dubuque, IA, R.M. 581. If the species is not in this area, the range would be reduced to 180 miles of the main stem of the Mississippi, a 66% loss.

Since 1965 *Lampsilis higginsii* has been recorded alive at about 35 general sites, but only a few sites are known to have a number of living specimens. Prime candidates for critical habitat designation are Muscatine, IA; Andalusia Slough, Andalusia, IL; Sylvan Slough, Rock Island, IL; just above Cordova, IL; Dubuque, IA; the area near the confluence of the Turkey River, IA; Prairie du Chien, WI, area; Whiskey Rock area below Lansing, IA; and the St. Croix River at Hudson, WI. These areas and additional areas having live *L. higginsii* should be monitored for adverse environmental changes such as impacts from commercial navigation, barge fleetings, dredging, pollution and commercial clamming (Havlik, 1980).

Little is known of the reproductive status or of live densities of *Lampsilis higginsii*, but studies done by Oblad (1980), Havlik and Marking (1980), and of Pool 10 of the Mississippi River by the Wisconsin Department of Natural Resources (P. Thiel, personal communication, 1980) are a beginning.

SPECIES VARIABILITY

None of the museums visited by the author from 1975 through 1980 has a large series of specimens. Therefore, identification of atypical specimens is somewhat difficult. The large series of specimens, valves and valve fragments recently collected from the Prairie du Chien, WI, area has enabled malacologists to discover the variations that exist in shell characteristics of *Lampsilis higginsii*. Colors of the periostracum range from bright green to olive-brown, reddish-brown, and brown to solid

yellow. The ray patterns may or may not be easily discerned; the intensity and width of the rays differs greatly. The nacre may be solid white or cream; or white or cream with pink or salmon in the beak cavity. Often the entire shell interior is varying shades of salmon or pink.

The shape of the shell may resemble *Obovata obovata* (Rafinesque, 1820) or *Actinonaias ligamentina carinata* (Barnes, 1823) as indicated by Baker (1928). Especially elongate specimens may resemble *Lampsilis radiata luteola* (Lamarck, 1819); some young specimens may resemble the generally lighter-weight shell of *L. venricosa* (Barnes, 1823), and one young specimen's shape resembled *Truncilla donaciformis* (Lea, 1827). I found that a number of *L. higginsii* and *L. orbiculata* specimens collected from an old commercial shell pile, that also contained many other species not indigenous to the Mississippi, could easily be distinguished on the basis of shell characteristics.

The most variable naiad species in the Upper Mississippi River system may be *Lampsilis higginsii*. Studies of shell specimens from animal middens will continue to greatly increase the knowledge of the range and of variation in the shell characteristics of this naiad (Stansbery, personal communication, 1977). *L. higginsii* specimens examined ranged from 22 mm to 114 mm in length.

Lampsilis higginsii appears to be the only naiad found in the Mississippi River and large tributaries that is not found elsewhere in the United States. Perhaps the question as to where this species spent its Pleistocene life will never be answered; however, I suggest that the Driftless Area of southwest Wisconsin, southeast Minnesota, northeast Iowa, and northwest Illinois might have served as a refuge for the species during the last glaciation, which terminated about 10,000 years ago. Archeological specimens of *L. higginsii* from the Driftless Area date back at least 2,000 years (University of Wisconsin, Madison) and this Driftless Area continues to contain the largest known living populations.

CONCLUSIONS

Lampsilis higginsii apparently has never been recorded in the Mississippi River from the junction of the Ohio River, R.M. 0, to the mouth of the Illinois River, R.M. 218. Presumably the 65 mile stretch of the Mississippi above the mouth of the Illinois contained this species, but it was not recorded until R.M. 283, Louisiana, MO. Only five locale records are known between Louisiana, MO, and the mouth of the Des Moines River, R.M. 361. Most of the records found were from the more northern reaches of the Mississippi, above the type locality at Muscatine, IA, R.M. 455.5. This situation still exists in 1980, but the range has been reduced from 528 miles to 251 miles, a 52.5% loss. *L. higginsii* appears to be extirpated from most major tributary rivers and the status is unknown on several other tributaries.

Lampsilis higginsii seems to be suffering the fate of several other North American naiad species; there is genetic diversity, but the range has markedly decreased. If the habitat continues to deteriorate, the existing populations of *L. higginsii* at Prairie du Chien, WI, and other critical areas will undoubtedly decline.

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