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Ligumia subrostrata (Bivalvia: Unionidae) in Minnesota and Its Status in the Upper Midwest

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ABSTRACT -- We documented the first records for the pondmussel (*Ligumia subrostrata*) in Minnesota. Extant populations of this bivalve were found in two southwestern Minnesota streams, Split Rock Creek, Pipestone County and the Rock River, Rock County. The presence of empty shells suggests additional populations also might occur in some other Big Sioux and Minnesota river tributaries. The Big Sioux River drainage appears to be a stronghold for the pondmussel in the upper Midwest, and our data suggested Minnesota might harbor the most substantial stream populations remaining in the region. Nonetheless, due to its limited distribution in Minnesota and rarity in nearby states, the pondmussel is now a candidate for protected species status in Minnesota.

Key words: distribution, freshwater mussel, Iowa, *Ligumia subrostrata*, Minnesota streams, Missouri River drainage, South Dakota, Unionidae.

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The pondmussel (*Ligumia subrostrata*) is a widespread unionoid found mostly in the shallows of small streams, sloughs, ponds, and lakes of the middle United States. Although its previously reported distribution in the Midwest extends into Iowa (Cummings and Mayer 1992) and South Dakota (Backlund 2000), this species has not been included among unionoids thought to occur in Minnesota (Dawley 1947, Graf 1997). Grier and Mueller (1922, 1923) reported it from the Mississippi River bordering Minnesota, an occurrence that Baker (1928) later discounted. In our paper we report the first verified records for the pondmussel from Minnesota and discuss its current status in the upper Midwest.

MATERIALS and METHODS

In July 1999, we began a survey to determine the distribution and abundance of unionoid mussels in Minnesota. Rivers and creeks were the primary focus of our study, although some lakes were sampled, and we accessed most sites at ridges and by boat. At each site, we sampled mussels by hand for two persons while wading, snorkeling, or using scuba gear, and made an effort to search all microhabitats (Hart et al. 2001). Due to turbid conditions at most sites, we searched for mussels by sweeping our hands back and forth on the substrate surface and by probing the substrate to find buried individuals. We placed all live and dead mussels encountered in mesh bags until the end of the search period. Empty shells with shiny nacre and intact periostracum were categorized as recently dead, and those with chalky nacre and worn periostracum, other than normal abrasional erosion, were categorized as weathered dead. We sampled 738 sites in the southern one-third of the state, and 1,167 sites statewide.

To locate the nearest vouchered records of the pondmussel relative to our collection sites, and to determine if there were other unreported collections of this species from Minnesota, we requested data from, or visited repositories that house major North American unionoid collections (Academy of Natural Sciences of Philadelphia, American Museum of Natural History, Harvard University Museum of Comparative Zoology, Illinois Natural History Survey, The Ohio State University Museum of Biological Diversity, United States National Museum of Natural History, University of Michigan Museum of Zoology) and local institutions with smaller collections (Minnesota Science Museum, University of Minnesota James Ford Bell Museum of Natural History).

RESULTS and DISCUSSION

Between 4 August and 5 October 1999, and on 7 June 2002, we collected specimens of the pondmussel from 15 sites in five streams in southwestern

Minnesota (Table 1). Voucher specimens from each stream were deposited in the mollusk collections at the University of Minnesota James Ford Bell Museum of Natural History (JFBM), St. Paul, Minnesota or the Illinois Natural History Survey (INHS), Champaign, Illinois. We collected a total of 25 live individuals from eight sites in two streams, the Rock River and Split Rock Creek, and recently dead or weathered shells were collected in Pipestone and Perch creeks and the Yellow Medicine River (Table 1). In the Rock River and Split Rock Creek, the pondmussel was collected live at 23.8% and 60.0% of the sites sampled, and comprised 0.9% and 3.6% of the mussel community, respectively. Our results are similar to other studies that have shown the pondmussel to make up a small percentage of stream mussel communities (Buchanan 1980, Schanzel and Cummings 1991, Obermeyer et al. 1997). Although, it can be more abundant in lentic habitats (Parmalee 1967, Oesch 1995). One female collected from Split Rock Creek on 22 September 1999 was gravid, however not all females were checked for gravidity. We found pondmussels primarily in riffle-run habitats less than 1 m deep in a substrate mixture of silt, sand, and gravel.

In our search of vouchered records, we found two previously unreported records of the pondmussel from Minnesota at the James Ford Bell Museum that were misidentified as yellow sandshell (*Lampsyllis teres*). The first was an unpaired valve (JFBM 6595) from North Branch Chanarambie Creek, Murray County, T106N, R43W, SW1/4, SE1/4, Sec. 29. The second was an unpaired valve in a mixed lot of *L. teres* (JFBM 2232) from Leech Lake, Cass County. Graf (1997) questioned the validity of this yellow sandshell record, and considered it a probable cataloging error. Because it is well outside the known range of the pondmussel, and there is no corroborating evidence of this species from the Mississippi River drainage above St. Anthony Falls at Minneapolis, we question this record as well. This valve is now cataloged as JFBM 12061.

Specimens of the pondmussel from northwestern Iowa and southeastern South Dakota in the holdings at The Ohio State University Museum of Biological Diversity (OSUM), United States National Museum of Natural History (USNM), and University of Michigan Museum of Zoology (UMMZ), and uncataloged material at the University of Sioux Falls (USF, uncataloged) (Keith Perkins, University of Sioux Falls, personal communication) are the closest vouchered records to our Minnesota collections we located (Table 2). Most of these records were from the Big Sioux River drainage, and several were from the same streams, or tributaries thereof, as our records in Minnesota (Tables 1 and 2). Therefore, based upon our collections from Perch Creek, which are the most distant from the Iowa and South Dakota records, we extend the pondmussel's previously reported range approximately 170 km to the northeast.

Williams et al. (1992) listed the pondmussel as currently stable throughout its range, however, its status in much of the upper Midwest appears to be less

Table 1. Locality and specimen data for collections of the pond mussel in southwestern Minnesota.

Stream	Drainage basin ^a	County	Lat-Long	Specimen condition	Catalog number ^b
Pipestone Creek	SRC < BSR < MOR	Pipestone	43°58'48"N, 96°26'09"W	recently dead	JFBM 9787
Rock River	BSR < MOR	Pipestone	43°57'53"N, 96°09'31"W	5 live	JFBM 9878
Rock River	BSR < MOR	Pipestone	43°58'45"N, 96°09'55"W	5 live	
Rock River	BSR < MOR	Pipestone	43°59'38"N, 96°10'09"W	4 live	JFBM 9883 INHS 24625
Rock River	BSR < MOR	Pipestone	43°56'25"N, 96°08'39"W	4 live	
Rock River	BSR < MOR	Pipestone	43°55'17"N, 96°07'44"W	1 live	
Rock River	BSR < MOR	Pipestone	43°57'00"N, 96°08'48"W	weathered dead	JFBM 9873
Rock River	BSR < MOR	Pipestone	43°52'39"N, 96°08'60"W	weathered dead	
Rock River	BSR < MOR	Rock	43°49'09"N, 96°07'59"W	weathered dead	JFBM 10101
Split Rock Creek	BSR < MOR	Rock	43°49'15"N, 96°24'53"W	3 live	JFBM 10067
Split Rock Creek	BSR < MOR	Rock	43°47'12"N, 96°26'47"W	2 live	JFBM 10089
Split Rock Creek	BSR < MOR	Rock	43°46'36"N, 96°26'14"W	1 live	JFBM 10082
Perch Creek	WR < BER < MNR	Blue Earth	43°59'46"N, 94°16'39"W	weathered dead	JFBM 9996
Perch Creek	WR < BER < MNR	Blue Earth	43°56'57"N, 94°20'42"W	weathered dead	JFBM 9938
Yellow Medicine River	MNR	Lyon	44°36'56"N, 95°51'57"W	weathered dead	JFBM 13157

^a BER = Blue Earth River, BSR = Big Sioux River, MNR = Minnesota River, MOR = Missouri River, SRC = Split Rock Creek, WR = Watonwan River.

^b JFBM = James Ford Bell Museum of Natural History, INHS = Illinois Natural History Survey.

Table 2. Ponds mussel records from northeastern Iowa and southeastern South Dakota.

State	Water body	Drainage basin	County	Year	Catalog number
Iowa	Ponds near Granite	BSR < MOR	Lyon	1910	USNM 526098
Iowa	Rock River	BSR < MOR	Lyon	1910	USNM 514773, 514774
Iowa	Rock River	BSR < MOR	Sioux	1912	USNM 477008
Iowa	Storm Lake	NRR < RR < DMR	Buena Vista	1912	USNM 528681, 528682
Iowa	North Raccoon River	RR < DMR	Sac	1912	USNM 519851, 534652
South Dakota	Big Sioux River	MOR	Moody	1997	USF uncataloged
South Dakota	Beaver Creek	SRC < BSR < MOR	Minnehaha	1999	USF uncataloged
South Dakota	Split Rock Creek	BSR < MOR	Minnehaha	1923	UMMZ 89658
South Dakota	West Pipestone Creek	SRC < BSR < MOR	Minnehaha	1998	USF uncataloged
South Dakota	Beaver Creek	BSR < MOR	Lincoln	1999	USF uncataloged
South Dakota	Brule Creek	BSR < MOR	Union	1999	OSUM 68507, USF uncataloged

^a BSR = Big Sioux River, DMR = Des Moines River, MOR = Missouri River, NRR = North Raccoon River, RR = Raccoon River, SRC = Split Rock Creek.

^b OSUM = The Ohio State University Museum of Biological Diversity, UMMZ = University of Michigan Museum of Zoology, USF = University of Sioux Falls, USNM = United States National Museum of Natural History.

favorable. In South Dakota, other than isolated records from Gregory and Walworth counties, this species is limited to the Big Sioux River and its smaller tributaries (Fig. 1). In recent surveys, no live individuals have been collected, although it might persist in Brule and Ponca creeks based upon the presence of recently dead shells (Douglas Backlund, South Dakota Department of Game, Fish and Parks, Pierre, South Dakota, Keith Perkins, and Dennis Skadsen, Natural History Investigations, Grenville, South Dakota, unpublished data). Historical ponds mussel records from Iowa show it was present in several drainages across the state and in sloughs of the Mississippi River (Fig. 1). However, recent surveys have documented only two live individuals from one site in Otter Creek (Rock

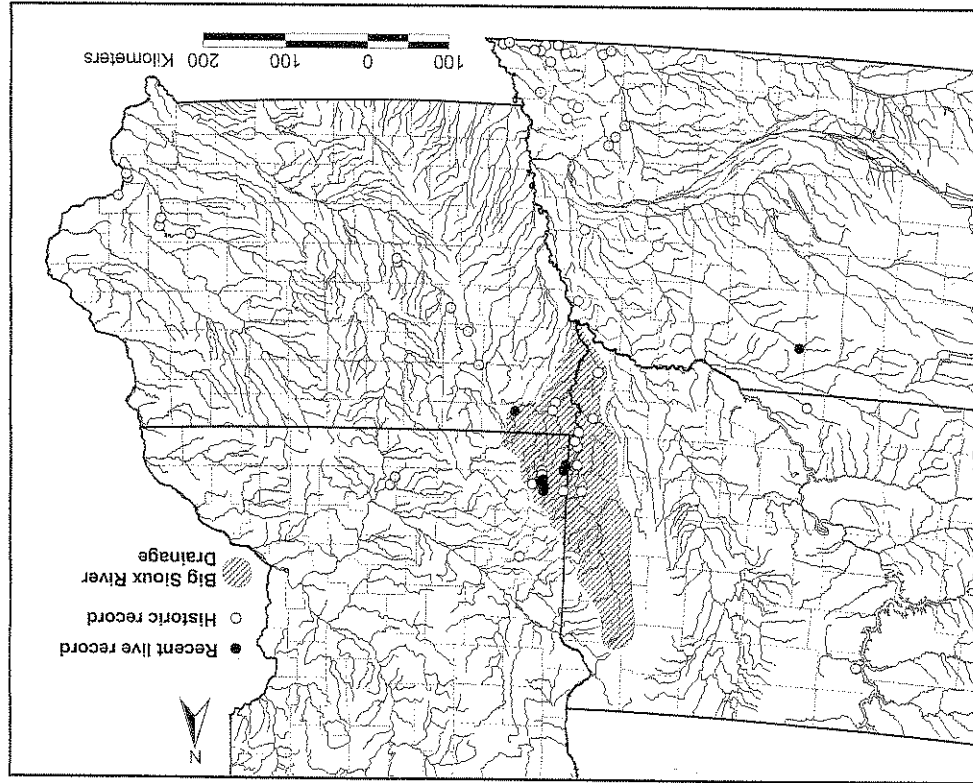
River-Big Sioux River drainage), Osceola County (Kelly Poole, Iowa Department of Transportation unpublished data), which suggested its range has been greatly reduced. Its conspicuous absence from most Missouri River tributaries in Iowa might be a consequence of limited sampling (Kelly Poole, personal communication), thus future attention to this area is warranted. In eastern Nebraska, the pondmussel was present historically in several Missouri River tributaries. However only one live individual from the Elkhorn River (Platte River drainage), Holt County (Fig. 1), has been collected in recent years, and it is considered to be extremely rare (Hoke 1994, 1995).

As a whole, these data indicate the Big Sioux River drainage is the primary stronghold for the pondmussel in the upper Midwest and even though our data set is small, it suggested that Minnesota might harbor the most substantial stream populations remaining in the region. In addition to populations in the Rock River and Split Rock Creek, the recently dead specimen collected from Pipestone Creek indicates the likelihood the pondmussel is still extant in that stream and possibly Perch and North Branch Chanarambie creeks and the Yellow Medicine River as well. The records from Perch Creek and the Yellow Medicine River have zoogeographic and conservation implications for the species in Minnesota because they are tributaries of the Minnesota River, far removed from their connection with the Missouri River by way of the Mississippi River. Possibly the pondmussel's dispersal into Minnesota was from two distinct routes, via the Mississippi-Minnesota and Missouri-Big Sioux rivers. However, there is no evidence of its presence in the Upper Mississippi River or its tributaries beyond central Iowa. An alternative hypothesis is that an event, such as stream capture or convergence of headwaters during a prolonged wet period, gave it access to the Minnesota River drainage via the Missouri River drainage. In any case, additional populations might be present in smaller tributaries of the Minnesota River. Also, given this species' affinity for slow or non-moving water, it might occur in habitats such as ponds or lakes that were not targeted in our study. Further sampling in perennial, low order streams and permanent, lentic water bodies, is needed to better assess the pondmussel's status in southern Minnesota. However, due to its limited distribution in Minnesota and the apparent paucity of populations in bordering states, the pondmussel is now a candidate for protected species status in Minnesota.

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Figure 1. Recent live and historical records of the pondmussel in Iowa, Minnesota, Nebraska, and South Dakota. Distribution points outside Minnesota were obtained from museum specimens, literature records (Hoke 1994, 1995, 1996, and 1997; Backlund 2000, Warren 2000), and unpublished data (see text).



data. We also are grateful to the museum curators and managers who provided us with information, loaned us material, or confirmed the identifications of specimens in their charge. Kevin Cummings was particularly helpful in procuring specimens for study. Teri Alberico and Christopher Pouliot provided valuable assistance with the figure. Richard Baker and Daniel Graf reviewed the manuscript and offered many helpful comments. Funding was approved and supported in part by the Minnesota Legislature, 1999 Minnesota Laws, Chapter 231, Section 16, Subdivision 15 (a), as recommended by the Legislative Commission on Minnesota Resources from the Minnesota Environment and Natural Resources Trust Fund and the Federal Wildlife Conservation and Restoration Program authorized by the Commerce, Justice, and State Appropriations Act of 2001, Title IX, Public Law 106-553.

LITERATURE CITED

- Backlund, D. C. 2000. Summary of current known distribution and status of freshwater mussels (Unionoidea) in South Dakota. *Central Plains Archaeology* 8:69-77.
- Baker, F. C. 1928. The fresh water Mollusca of Wisconsin. Part II. Pelecypoda. *Bulletin of the Wisconsin Geological and Natural History Survey* 70:1-495.
- Buchanan, A. C. 1980. Mussels (Naiades) of the Meramec River basin, Missouri. *Aquatic Series* 17, Missouri Department of Conservation, Jefferson City, Missouri.
- Cummings, K. S., and C. A. Mayer. 1992. Field guide to freshwater mussels of the Midwest. *Illinois Natural History Survey Manual* 5, Champaign, Illinois.
- Dawley, C. W. 1947. Distribution of aquatic mollusks in Minnesota. *American Midland Naturalist* 38:671-697.
- Graf, D. L. 1997. Distribution of unionoid (Bivalvia) faunas in Minnesota, USA. *Nautilus* 110:45-54.
- Grier, N. M., and J. F. Mueller. 1922. Notes on the naiad fauna of the Upper Mississippi River. II. The naiades of the Upper Mississippi Drainage. *Nautilus* 35:46-49.
- Grier, N. M., and J. F. Mueller. 1923. Notes on the naiad fauna of the Upper Mississippi River. II. The naiades of the Upper Mississippi Drainage. (Continued). *Nautilus* 36:96-103.
- Hart, R. A., T. Brastrup, D. E. Kellner, and M. Davis. 2001. The freshwater mussel fauna (Bivalvia: Unionidae) of the Knife River, Minnesota, following a rotenone treatment. *Journal of Freshwater Ecology* 16:487-492.
- Hoke, E. 1994. A survey and analysis of the unionid mollusks of the Elkhorn River basin, Nebraska. *Transactions of the Nebraska Academy of Sciences* 21:31-54.
- Hoke, E. 1995. A survey and analysis of the unionid mollusks of the Platte rivers of Nebraska and their minor tributaries. *Transactions of the Nebraska Academy of Sciences* 22:49-72.
- Sietman et al.: *Pondmussel in Minnesota*
- Hoke, E. 1996. The unionid mollusks of the Big and Little Nemaha River basins of southeastern Nebraska and northeastern Kansas. *Transactions of the Nebraska Academy of Sciences* 23:37-57.
- Hoke, E. 1997. The unionid mollusks of the upper Kansas Basin of northwestern Kansas and southwestern Nebraska. *Transactions of the Nebraska Academy of Sciences* 24:35-62.
- Obermeyer, B. K., D. R. Edds, C. W. Prophet, and E. J. Miller. 1997. Freshwater mussels (Bivalvia: Unionidae) in the Verdigris, Neosho, and Spring River basins of Kansas and Missouri, with emphasis on species of concern. *American Malacological Bulletin* 14:41-55.
- Oesch, R. D. 1995. Missouri naiades: a guide to the mussels of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.
- Parmalee, P. W. 1967. The fresh-water mussels of Illinois. Illinois State Museum, Popular Science Series, Volume 8.
- Schanzel, R. W., and K. S. Cummings. 1991. A survey of the freshwater mussels (Bivalvia: Unionidae) of the Sangamon River basin, Illinois. *Illinois Natural History Survey Biological Notes* 137.
- Warren, R. E. 2000. Prehistoric procurement and use of freshwater mussels along the Missouri River in the northern Great Plains. *Central Plains Archaeology* 8:79-97.
- Williams, J. D., M. L. Warren Jr., K. S. Cummings, J. L. Harris, and R. J. Neves. 1992. Conservation status of freshwater mussels of the United States and Canada. *Fisheries* 18:6-22.

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