

Mass Mortality of Mussels from Slumping Along the Red Lake River Near Crookston, Minnesota

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During the Labor Day weekend, 1980, a slump occurred on the outside of a meander of the Red Lake River (NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T.149 N., R.46 W.), about 2 km east of Crookston and just southwest of St. Joseph's Provincial House, a residence for nuns. St. Joseph's slump is about 366 m wide at its crown at the north edge of U.S. Highway 2 and 168 m wide near its toe along the left bank of the Red Lake River; its slope length, discounting that part of the slump removed by the river and that along the right bank, is about 100 m. As the slump moved to the northwest, it raised a segment of the river channel subaerially, resulting in the mass mortality of numerous mussels. We were informed of this biologic event by Dr. John R. Reid, Professor of Geology at the University of North Dakota, whose geomorphology class mapped the slump and provided us with its dimensions.

On September 14, 1980, we identified and counted all mussels with adhering flesh that we observed within about 1600 m² (area determined by pace), or 68% of the river-breached raised channel along the left bank. (The raised channel along the right bank was inaccessible because of the depth and swiftness of the river.) Also, we counted and identified all mussels from two 1-m² quadrants, at the upstream part of the raised channel where density appeared to be at a maximum, for a total of 1098 individuals (Table 1).

Eleven species of mussels were affected in the mass mortality, five of which were decimated in greatest numbers: *Lampsilis radiata*, *Amblema plicata*, *Prop-tera alata*, *Lampsilis ovata*, and *Fusconaia flava*. Many individuals were in growth position, with posterior ends uppermost, and many were still alive where water saturated the substrate in depressions. Calculating the area of the raised channel at about 6100 m² and using the conservative average density of 0.5 mussel/m² (derived from counts for the 1600-m² examined area), at least 3,050 mussels may have been raised subaerially by the slump. Perhaps about two-thirds of this number were actually decimated because the river, in cutting through the raised channel, would have returned previously exposed mussels to the water.

The slump-raised channel afforded an unusual opportunity to view mussel diversity and density on a river botton. Of five mussel stations examined by one of

Table 1. Mussel species and individuals on slump-raised channel of the Red Lake River near Crookston, Minnesota.

Mussel species	Individuals counted		
	1600 m ² -area	^a 1 m ² -area	^a 1 m ² -area
1. <i>Amblema plicata</i> (Say)	187	27	30
2. <i>Fusconaia flava</i> (Rafinesque)	53	26	21
3. <i>Quadrula quadrula</i> (Rafinesque)	9	0	2
4. <i>Anodonta grandis</i> (Say)	3	1	0
5. <i>Lasmigona complanata</i> (Barnes)	0	0	1
6. <i>L. costata</i> (Rafinesque)	1	0	0
7. <i>Strophitus undulatus</i> (Say)	5	3	3
8. <i>Lampsilis ovata</i> (Say)	81	18	17
9. <i>L. radiata</i> (Gmelin)	239	57	51
10. <i>Ligumia recta</i> (Lamarck)	35	9	3
11. <i>Proptera alata</i> (Say)	182	33	1
	795	174	129

^aQuadrats were 1.6 m apart and 15 m upstream from the 1600 m²-area.

us (AMC) in the lower Red Lake River in 1965 (Cvancara 1970), all yielded fewer species alive (2-9) than the St. Joseph's slump station, and all but one station displayed a lower mussel density. The differences reflect, at least in part, the difficulty in collecting reliably at the five stations because of water depth and turbidity.

We believe that the channel rose rather quickly. This is indicated by many mussels in growth position and the almost total lack of mussel trails.

LITERATURE CITED

Cvancara, A. M. 1970. Mussels (Unionidae) of the Red River Valley in North Dakota and Minnesota. U.S.A. Malacologia 10(1): 57-92.