

**NORTH DAKOTA GEOLOGICAL SURVEY**

**WILSON A. LAIRD, State Geologist**

**Miscellaneous Series No. 12**

**Late Wisconsin Mollusca From  
Ice-Contact Deposits in  
Logan County, North Dakota**

by  
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Reprinted from  
**Proceedings of the North Dakota Academy of Science**  
Volume XV, pp. 11-18, 1961

(Grand Forks, North Dakota, 1961)

*Reprinted from N.D. Academy of Science Proceedings, Volume XV, 1961 Meeting*

**LATE WISCONSIN MOLLUSCA FROM ICE-CONTACT  
DEPOSITS IN LOGAN COUNTY, NORTH DAKOTA**

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**INTRODUCTION**

During the summer of 1960, while mapping the glacial geology of northern Logan County, North Dakota, I collected samples of fossil Pleistocene fresh-water mollusk shells from four different localities. These shells were found in deposits of ice-contact stratified drift that was deposited from dead glacial ice during the last part of the Wisconsin Age, probably during the last part of the Woodfordian Subage of Frye and Willman (5, p. 2).

**COLLECTION AND IDENTIFICATION**

No attempt was made to make an extensive collection of the Pleistocene fossils of Logan County; the samples were merely collected during the course of field mapping. Samples from two localities consist of the more conspicuous shells that were picked off a fresh surface of the exposure. At two other localities a few quarts

sample was taken with a hand auger from a 4 foot bed of marl, which overlies an undetermined thickness of dark grey lake clay. The marl and clay were deposited in an irregular partly ice-walled lake that was associated with the dead Burnstad ice; the deposit probably belongs to the upper part of the Woodfordian Substage (see Fig. 2).

		LaKe Michigan lobe (5)	S. DaK. (3)	This Report	
Approximate age: 1000 yrs. B.P.	0	RECENT STAGE			
	10	VALDERAN SUBSTAGE			
		TWOCREEKAN			
	20	WOODFORDIAN SUBSTAGE	Cary drift Tazewell drift	B1 Mankato A1 Mankato Cary	Streeter drift Burnstad drift ?Long LaKe drift
		FARMDALIAN SUBSTAGE			
	30	WISCONSINAN	ALTONIAN SUBSTAGE		
Tazewell Iowan				"older drift"	

FIGURE 2. Suggested correlation of drifts in Fig. 1 of this report.

Two quarts of the marl were collected from an auger hole, and a few hundred mollusk shells were sieved from part of the sample. The following mollusks were identified:

	UND No.
<i>Amnicola leightoni</i> Baker	1777
<i>Armiger crista</i> (Linnaeus)	1785
<i>Gyraulus parvus</i> (Say)	1778
<i>Helisoma trivolvis</i> (Say)	1779
Unidentified Lymnaeidae	1780
<i>Pisidium</i> sp.	1781
<i>Promenetus exacuus</i> (Say)	1782
<i>Valvata tricarinata</i> (Say)	1783
<i>Valvata</i> sp.	1784

The most abundant species are *Gyraulus parvus*, *Promenetus exacuus*, and *Valvata tricarinata*. Ostracodes are also abundant.

All of the identified mollusks, except *Aminicola leightoni*, which is believed to be extinct, are found today in the Upper Midwest in a wide range of quiet fresh-water environments. However, *Valvata tricarinata* is found in bodies of water that do not dry up from year to year (13, p. 48). Most of the mollusks live only where there is submerged vegetation. It is assumed that environmental preferences of these mollusks were the same in late Wisconsinan time as they are today. Therefore the environment is thought to have been a fairly warm, quiet, and relatively permanent body of water with submerged vegetation.

#### Fauna from Streeter drift

Mollusk shells were collected from deposits of ice-contact drift at three different localities (see Fig. 1) in the Streeter dead-ice moraine (7, p. 55). The Streeter drift is slightly younger than the Burnstad drift but probably also belongs to the upper part of the Woodfordian Substage (see Fig. 2).

**Locality s-1.**—Locality s-1 is a roadcut at the northwest corner of sec. 28, T. 135 N., R. 68 W., 11 miles south-southwest of the town of Gackle. Fossils were taken from a small deposit of ice-contact lake silt capping a 50-foot high hill in dead-ice moraine behind the Streeter end moraine.

Three quarts of the fossiliferous silt were collected, and a few hundred shells were sieved from part of the sample. The following mollusks were identified:

	UND No.
<i>Aminicola leightoni</i> Baker	1759
<i>Armiger crista</i> (Linnaeus)	1760
<i>Fossaria</i> sp.	1766
<i>Gyraulus parvus</i> (Say)	1762
<i>Helisoma campanulata</i> (Say)	1763
<i>Physa</i> sp.	1764
<i>Pisidium</i> sp.	1765
<i>Promenetus exacuus</i> (Say)	1794
<i>Valvata tricarinata</i> (Say)	1767
<i>Valvata</i> sp.	1768

*Aminicola leightoni*, *Gyraulus parvus*, and *Valvata tricarinata* are the most abundant species. Also present are *Charcaceae oogonia* and abundant ostracode carapaces.

This fauna is similar to that found in the Burnstad drift, indicating a rather warm, shallow, and quiet body of fresh water with submerged vegetation.

**Locality s-2.**—Locality s-2 is a roadcut 0.4 miles south of the northwest corner of sec. 20, T. 135 N., R. 67 W., 9 miles south of Gackle. Shells were taken from the base of a 1½ foot layer of silty and pebbly outwash sand lying on an undetermined thickness of lake clay. The exposure is in the middle of a 1½ mile wide ice-

contact lake plain that is elevated slightly above the surrounding dead-ice moraine. This lake was bounded on at least three sides by the Streeter advance; the deposit is approximately the same age as that at locality s-1.

Only the most conspicuous shells were picked out of the sand. Articulated shells of at least two large thick-shelled species of the pelecypod family Unionidae (UND no. 1961) are quite common. Because the shells were so close to the surface, they are badly weathered and could not be identified. One shell each of *Sphaerium* sp. (UND no. 1770) and *Helisoma campanulata* (Say) (UND no. 1769) were also collected from the sand.

The presence of the abundant unionid shells and sorted outwash sand indicates that the environment was rather warm, moving melt-water.

**Locality s-3.**—Locality s-3 is a roadcut 0.4 mile north of the southwest corner of sec. 9, T. 136 N., R. 69 W., 4 miles south of Streeter. The deposit is a small body of ice-contact lake clay at the south edge of a 1½-mile wide ice-contact outwash plain. The clay and outwash was deposited by meltwater from the dead Streeter ice mass and is approximately the same age as the ice-contact deposits at localities s-1 and s-2.

Nearly 100 of the more conspicuous shells were picked from a fresh surface of the roadcut. The following mollusks were identified:

	UND No.
<i>Amnicola leightoni</i> Baker	1771
<i>Gyraulus parvus</i> (Say)	1772
<i>Gyraulus</i> sp.	1773
<i>Helisoma anceps</i> (Menke)	1774
<i>Helisoma campanulata</i> (Say)	1795
<i>Succinea avara</i> (Say)	1795
<i>Valvata tricarinata</i> (Say)	1775
Unidentified unionid fragments	

This fauna is similar to those found in the Burnstad drift and in the Streeter drift at locality s-1, except that it has a few shells transported from environments other than quiet water. *Succinea* is terrestrial and members of the Unionidae often live in moving water.

#### Other occurrences

Shells of one or more large species of Unionidae have recently been found in south-central North Dakota in three other (see Fig. 1) ice-contact deposits that are thought to be approximately the same age as those described above. They are found at locality b, 0.5 mile south of the northwest corner of sec. 20, T. 132 N., R. 68 W., McIntosh County (John W. Bonneville, personal communication); locality t, SE¼SW¼ sec. 17, T. 139 N., R. 67 W., Stutsman County (14); and locality h, SE¼SE¼SE¼ sec. 29, T. 137 N., R. 69 W., Stutsman County (Charles J. Huxel, Jr., personal communication).

Gastropod shells were also collected from a roadcut in a small marl deposit at locality n (Fig. 1), 0.4 mile south of the northwest corner of sec. 35, T. 135 N., R. 73 W., in western Logan County. However, this is probably not an ice-contact deposit, and its stratigraphic position is not definitely known.

Gastropod shells are also abundant in post-glacial deposits in closed depressions on the Streeter and Burnstad drifts.

### CONCLUSIONS

**Water temperature.**—Such a varied and widely distributed fresh-water molluscan fauna in ice-contact stratified drift, to my knowledge, has never been described before. It is surprising that any life existed in meltwater so closely associated with glacial ice. It is believed that because the mollusks probably required temperatures similar to those of present-day North Dakota (14), the "ice-contact" bodies of water in which they lived were well insulated from the dead glacial ice by thick ablation drift. (The presence of this ablation drift is of considerable importance in the controversy over the origin of dead-ice moraine; in Alberta, Stalker (12, p. 32) believes that super-glacial drift is insignificant and "ice-pressing" of sub-glacial drift is a more important factor in the formation of dead-ice features.)

It is also evident that the ice that formed the dead-ice moraine melted slowly; it is thought that large amounts of cold meltwater would have kept the bodies of water too cold for the existence of the faunas described above.

**Water siltiness.**—Another evidence that the drift-covered dead ice melted slowly is the presence of *Valvata* and *Amnicola* in the ice-contact deposits. These prosobranch snails have gills and according to Frye and Leonard (4, p. 160) require relatively silt-free water. Meltwater was evidently formed slowly enough for the silt to settle out and for the water to be warmed by the sun.

**Dispersal.**—The presence of numerous species of gastropods in these relatively short lived ice-contact bodies of water suggests that they could migrate rapidly from nonglacial environments. Many of the ice-walled lakes probably had no direct connection with the proglacial drainage system; the fresh-water gastropods and *Pisidium* may have been carried into these lakes in mud on legs and feathers of water birds. Baker (2, p. 39-40), Yen (15, p. 294), and Pennek (10, p. 682) agree that water birds are an important means of geographic dispersal of fresh-water gastropods and small pelecypods. Because rapid dispersal is indicated here, it is surprising that La Rocque (in 6, p. 291) thinks that the absence of *Sphaerium*, *Valvata*, and *Amnicola* from the deposits of a large late Wisconsinan proglacial lake (300 miles from the supposed location of the ice front) in Saskatchewan indicates a young undeveloped fauna and an environment that was reached with difficulty by mollusks. The

rapidity with which snails can be dispersed may not be generally recognized.

The presence of shells of the members of the Unionidae in the Streeter drift at localities s-2 and s-3 may indicate that the water in which these clams lived was connected with the proglacial drainage system. In their larval stages, Unionidae are parasitic on fish; therefore fish must have been present in the meltwater at these two localities. To get there, the fish probably had to swim up several miles of superglacial meltwater streams. Studies of the distribution of pelecypods in ice-contact deposits may help determine the pattern of superglacial drainage systems. This would show the general shape of the dead ice mass, and this in turn would be of considerable help in solving the problems of formation of dead-ice moraine and its various dead-ice features.

**Stratigraphic value.**—It thus seems that the study of late Wisconsinan fresh-water mollusks in south-central North Dakota will help solve many of the problems of local glacial geologic history. However, the regional stratigraphic value (that is, dating of deposits) of these mollusks is in doubt. In Kansas, mollusks have been found by Frye and Leonard (4, p. 147) to be the most useful fossil for Pleistocene stratigraphic correlations. The Pleistocene problems there, however, are considerably different from those of North Dakota. First, the Pleistocene subdivisions of Kansas consist mainly of loess and alluvium that contain a large proportion of land gastropods. Because of the works of Pilsbry (11), land gastropods can be fairly easily and confidently identified, whereas fresh-water gastropods are still imperfectly known. Secondly, the Pleistocene deposits of Kansas have been divided into several stratigraphic units, each representing several thousand years, whereas the surface drift over much of North Dakota consists of till believed to have been deposited in only a few thousand years. So, at the present time, it seems that fresh-water mollusks will have little stratigraphic value in the northeastern two-thirds of North Dakota.

However, in southwestern North Dakota, where geomorphic correlation of older deposits is difficult, land gastropods, if found abundantly in loess or alluvium, may prove to be of considerable help in unraveling Pleistocene history.

#### SUMMARY

In summary, the Pleistocene mollusks that have been found in south-central North Dakota are apparently useful environmental indicators but are of little stratigraphic value. However, conclusions presented in this report are tentative and much more extensive studies need to be made on North Dakota Pleistocene molluscan faunas.

#### ACKNOWLEDGMENTS

I wish to sincerely thank Dr. F. D. Holland, Jr. for his many suggestions and for his critical reading of the manuscript and S. J. Tuthill for our numerous conversations in which many of the ideas presented here were developed.

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