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Lake Sediments in
Sheridan County, North Dakota

by
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LATE PLEISTOCENE FISH FROM LAKE SEDIMENTS IN SHERIDAN COUNTY, NORTH DAKOTA¹

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INTRODUCTION

During the summer of 1962, while mapping the glacial geology of western Sheridan County, North Dakota, samples of fresh-water mollusk shells from ice contact lake sediments were collected. These sediments were found on a dump pile of a recently dug stock pond located on top of the Prophets Mountains in Sheridan County. At a later date the Pleistocene fish fossils discussed below were found and collected by Dr. John R. Reid, Assistant Professor of Geology, University of North Dakota and Mr. Thomas C. Gustavson and me, graduate students in geology at the University of North Dakota.

SUMMARY OF THE GLACIAL GEOLOGY OF THE PROPHETS MOUNTAINS AREA

The Prophets Mountains lie within the Missouri Coteau District which, according to Fenneman (8), is in the Missouri Plateau (Glaciated) Section of the Great Plains Province. These hills are a topographically prominent part of the Lincoln Valley moraine, standing 300 feet above the surrounding area. The Lincoln Valley moraine has partly overridden and truncated the Streeter moraine. The Streeter moraine is a prominent feature that can be traced from McIntosh County, near the South Dakota border, to its truncation by the Lincoln Valley moraine in western Sheridan County.

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According to Frye and Willman (9), the last stages of the Pleistocene Epoch are divided into the Wisconsinan Stage which began 70,000 to 50,000 radiocarbon years ago and ended approximately 5,000 radiocarbon years ago and the Recent Stage which began 5,000 radiocarbon years ago. The Wisconsinan Stage has been subdivided by Frye and Willman (10) into the Altonian Substage (50-70,000 - 28,000 radiocarbon years B.P.), the Farmdalian Substage (28,000 - 22,000 radiocarbon years B.P.), the Twocreekan Substage (12,500 - 11,000 radiocarbon years B.P.) and the Valderan Substage (11,500 - 5,000 radiocarbon years B.P.).

Mollusk shells and spruce wood in the Burnstad Drift, of which the Streeter moraine is a part, have been dated in Kidder, Stutsman, Logan and McIntosh Counties and have been found to be $9,000 \pm 300$ to $11,650 \pm 310$ radiocarbon years old. According to Clayton (2) the $11,650 \pm 310$ date is "from clam shells found in Burnstad lake sediment in a ridge (push ridge?) of the Streeter moraine." If Clayton's tentative interpretation of the geology of the site in which the clams were found is correct, then the glacier which deposited the Streeter moraine was active after $11,650 \pm 310$ radiocarbon years B.P. The Streeter moraine would then be less than $11,650 \pm 310$ radiocarbon years old. Since the Lincoln Valley moraine truncates the Streeter moraine, it must be younger than the Streeter moraine; therefore it is also less than $11,650 \pm 310$ radiocarbon years old.

The Lincoln Valley moraine, though younger than the Streeter moraine, does not represent a significant glacial advance; outwash, formed at the front of the Lincoln Valley moraine, is collapsed in the Burnstad Drift that is associated with the Streeter moraine, indicating that a mass of stagnant ice existed in front of the Lincoln Valley moraine at the time of its deposition. Furthermore the Lincoln Valley moraine and its associated drift and the Streeter moraine and its drift are similar in lithology and topography. For these reasons the Lincoln Valley Drift is considered to be part of the Burnstad Drift.

The glacier that deposited the Lincoln Valley moraine ultimately stagnated and superglacial lakes insulated from the ice by ablation drift were formed. It was in these lakes that the mollusks and fish reported here lived. Meltwater channels also present during this time flowed down to the terminus of the ice.

DESCRIPTION OF THE PROPHETS SITE

Location—The sediments in which the mollusk shells and fish remains were found were located on the dump pile of a recently dug stock pond. The pond is located in a depression between two linear parallel ridges of the Lincoln Valley moraine, 0.2 mile south and 0.2 mile east of NE cor., sec. 29, T. 147 N., R. 78 W., Sheridan County, North Dakota.

Lithology — The sediments in which the fish were found are composed of a grey calcareous silty clay. Much of the sediment ap-

pears to be rhythmically bedded and they may possibly be glacial varves.

Fauna — Species of the white sucker, *Catostomus commersoni* (Lacépède, creek chub, *Semotilus atromaculatus* (Mitchill), and finescale dace, *Chrosomus neogaeus* (Cope), were found at the Prophets site. The fish have been only tentatively identified. These fish are common varieties found living today and, according to Carufel (1), occurrences of all but the finescale dace have been reported in North Dakota.

According to Eddy (4) and Eddy and Surber (6), the white sucker is very common east of the Rockies from southern Canada south to Colorado, Missouri and Georgia. It is abundant in all the waters of Minnesota, Wisconsin and nearby states. The white sucker occurs in enormous numbers in the headwaters of tributaries to the Mississippi and in the streams and lakes of the Superior, Rainy, and Red River drainages.

Eddy and Surber (7) note that the chub is found from Montana to eastern Canada and south to the Gulf Coast. It is common in all parts of Wisconsin and attains wide distribution over Minnesota. The chubs prefer small rivers and large creeks, but they are occasionally found in lakes.

According to Eddy (5), the finescale dace is found from north-west Canada to New England and south to northern Minnesota, Wisconsin, and Michigan. Isolated populations are found in western Nebraska and in the Black Hills.

The species of mollusks found at the Prophets site were identified by Mr. Samuel J. Tuthill, graduate student at the University of North Dakota, and he states (personal communication):

"The 15 specimens of mollusks which were included in the sediment sample from the Prophets site are too few to warrant much speculation as to the ecologic conditions of the body of water in which they lived. The following organisms were identified:

Mollusca:	Pelecypoda;	5 <i>Pisidium</i> sp. valves
	Gastropoda;	1 <i>Armiger crista</i> (Linne), 1758
		2 <i>Gyraulus parvus</i> (Say), 1817
		3 <i>Lymnaea humilis</i> (Say), 1822
		4 <i>Lymnaea</i> sp. cf. <i>L.</i> <i>palustris</i> (Miller)
Arthropoda:	Ostracoda;	6 valves of freshwater ostracodes

Algae: several oögonia of calcareous algae, probably of the genus *Chara*

This assemblage suggests the existence of seasonally temperate body water. Because algae require light for photosynthesis, the oögonia indicate that the water was clear. The gastropods are all pulmonate forms and could have withstood seasonal drying of the environment, but the presence of fish remains weakens this line of logic at least for the time during which fish occupied the body of water. The mollusks are all typical of quiet water bodies, but this alone does not prove that the body of water was a lake, as many streams possess aquatic habitats quite similar to lakes. Aquatic and marginal vegetation was probably abundant.

The fossil mollusks are not indices for geologic age of the sediments, as they are conspecific with the present molluscan fauna of the Missouri Coteau district in North Dakota. However, if a sufficient quantity of shell material was obtained from future collections it could be dated by the radiocarbon method; the present collection is too small for this purpose."

DISCUSSION

The finding of these fish marks the first known discovery of Pleistocene fish remains in North Dakota. It was previously thought by Clayton (2) and Tuthill and others (11) that fish existed in the ice contact lakes of the Missouri Coteau during the Upper Wisconsinan becausenaiads, whose glochidia are parasitic on fish, have been found in many localities in the Missouri Coteau district.

The evidence for the upper Wisconsinan age of the fish remains is strong, though not conclusive. The only feasible way in which Recent age fish could have reached the top of the Prophets Mountains would be in the beaks of pelicans or other birds which prey on fish. The large number of fish specimens found would tend to reduce this possibility, but not disprove it.

The fish probably reached the area of the Prophets Mountains during the period when drift-covered stagnant ice existed in front of and on the Lincoln Valley moraine. The fish could then have easily swum up drift-insulated meltwater streams from beyond the terminus of the ice and established successful populations in the ice contact lakes that existed in the area of the Prophets site at that time.

The only other possible explanation for the topographically isolated occurrence of these fish remains is that they were displaced from their original site of deposition by glacial shearing during the formation of the Lincoln Valley moraine. This is improbable because the fish remains are well preserved and are not contorted. Deforma-

tion of the soft clay sediments, fish remains, and the mollusk shells would be expected if they were carried in shear planes in the ice.

SUMMARY

This preliminary investigation of the Prophets site indicates that there are three possibilities for the occurrence of the topographically-isolated fish remains: they may have been carried in sediments by terminal glacial shearing, they may have been carried by pelicans or other birds that prey on fish, or they may have swum up meltwater channels in the drift-covered stagnant ice. The evidence seems to indicate that the latter hypothesis is the most feasible. It is hoped that future studies of the Prophets site will reveal more evidence to support the late Wisconsinan age of the fish remains.

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