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## MOLLUSCA OF NORTH DAKOTA

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North Dakota has received little attention from conchologists, a fact probably accounted for largely by the character of the country. Scattered notices of shells from the bordering states of Montana and Minnesota have appeared from time to time, Hanham<sup>1</sup> lists the land and freshwater shells of Manitoba, Over<sup>2</sup> enumerates the mollusks of South Dakota, but for North Dakota proper only one short list by Daniels<sup>3</sup> has been published. Dall's volume on the Alaskan fauna<sup>4</sup> includes of course many species whose range extends across the state of North Dakota, but specific records for the state are not given. The present paper is intended, therefore, as a contribution to a knowledge of the fauna of this semi-arid region. Conditions vary so much within the limits of the

<sup>1</sup> *Nautilus*, XIII, 1899, pp. 1-6.

<sup>2</sup> *Nautilus*, XXIX, 1915, pp. 79-81, 90-95.

<sup>3</sup> *Nautilus*, XXXIV, 1920, p. 29.

<sup>4</sup> *Harriman Alaska Expedition*, XIII, Land and Fresh water Mollusks, 1905.

state that the list can be considered only a preliminary one. Exploration of the extreme northeastern corner of the state and of the Red River is especially desirable and would undoubtedly add many species to the present list.

During the summer of 1919 an opportunity was offered to collect mollusks in North Dakota through the generous cooperation of Dr. R. T. Young, Director of the State Biological Station at Devils Lake, N. D., with the Museum of Zoology. The work was undertaken as part of a survey of the fauna of the state, begun by Miss Crystal Thompson for the State of North Dakota. A careful study of the immediate vicinity of Devils Lake was possible, together with a reconnaissance of nearby localities. In the Turtle Mountains five days were devoted to collecting and a general survey of a topography differing widely from that of the Devils Lake region. Every facility was offered for work and the care of material at the Station, and trips into the surrounding country were comparatively easy.

Further collecting in the western part of the state in 1920 by Miss Thompson and N. A. Wood, of the Museum of Zoology, resulted in the addition of several species and locality records to the 1919 list. Collections of drift rich in small land shells were taken from the banks of the Missouri and the Little Missouri at various points.

Without the help of Mr. Alfred Eastgate, Deputy Game Warden, the work in the Turtle Mountains could not have included so much territory. With his assistance we were able to collect in widely separated localities. Mr. Eastgate also contributed clams and Sphæriidae from the Sheyenne River.

A large proportion of the 1919 collection has been submitted to specialists for identification, and most of the identifications by the writer have been verified by them. I am under obligations to the following persons for examining and nam-

ing species in the families and genera indicated: Dr. Bryant Walker, Ancyliidae, Amnicolidae and Unionidae; Dr. Victor Sterki, Sphæriidae, Valloniidae, Pupillidae; Dr. H. A. Pilsbry, Succineidae; Dr. F. C. Baker, the smaller Planorbis.

All 1920 material, with the exception of Ferrissia, Amnicola and Planorbis (identified by Dr. Walker), have been identified by comparison with that of the preceding year.

#### NOTES ON HABITATS

A detailed description of the Devils Lake and Turtle Mountains region has been published by the Geological Survey,<sup>5</sup> but a general outline drawn largely from that source may be of interest here. Devils Lake lies in the northeastern part of the state about a hundred miles west of Grand Forks. It is in the Drift Prairie Plains, between the Red River Valley and the Great Plains Plateau. It is a brackish lake of glacial origin, extremely irregular in outline and shallow; and in 1919 it was about fifteen miles in greatest length and four and a half miles at its greatest width. From year to year the water level varies, having receded in all 14.13 feet during the period between 1883, when it was first surveyed, and 1912. Fluctuation of level is characteristic of all the small lakes of the region, though some of them remain fresh enough, by reason of an adequate water-shed, to support a molluscan fauna. No snails or clams inhabit Devils Lake or waters of similar alkaline composition, but bleached snail shells on old beach lines indicate once flourishing colonies.

The Turtle Mountains, with an area of 600 to 800 square miles, extending into Canada, form a group of low morainic hills interspersed with glacial lakes. The distance to be cov-

<sup>5</sup> Simpson, Howard E., The Physiography of the Devils-Stump Lake Region, North Dakota. Sixth Biennial Report, *N. D. State Geol. Surv.*, 1912, pp. 103-157.

ered in a short time made it impossible to collect intensively in many interesting places. The number of species listed from Upsilon and Gravel Lakes, however, promises well for future records of other lakes in this locality.

The specific localities in which collections were made may be described briefly as follows:

#### THE DEVILS LAKE REGION

Devils Lake: The shores near the Biological Station are wooded with oak, elm, aspen and other trees, and the same vegetation prevails on the south shore near Sullys Hill, where, however, a moister ground and denser undergrowth prevail. Dead shells of water snails were taken from the shore below Sullys Hill as well as from the vicinity of the Station, but these were either very old and chalky, or had been washed in from some coulee in time of high water.

Court Lake: A fresh pond which was at one time a part of Devils Lake. Rushes and reeds line the shores, and the bottom is gravelly. Around the lake, woods of the usual sort formed a habitat for the small land snails.

Fort Totten Lake: A small fresh pond south of Devils Lake, with Sullys Hill and outlying hills for its water-shed. Reeds and rushes almost surround it, and it is nearly filled with a luxuriant growth of chara and elodea.

Big Mission Lake: Once a part of Devils Lake, and now a characteristic alkaline pond. Old shells in considerable numbers occur on old beach lines, and probably indicate to some extent the character of the fauna once inhabiting Devils Lake.

Mauvaise Coulee: Contained a sluggish stream, with hardly perceptible current. It probably emptied a small quantity of water into Devils Lake during the summer of 1919, though the outlet into the lake was so choked with deposits of muck and silt that it seemed evident that there had been little active

inflow for years. The mollusks are those of a stagnant pond, *Aplexa* and *Segmentina* thriving here as well as in the Lac aux Morts complex to the north. The similarity of the two faunas bears out the geological evidence of a former connection between Lac aux Morts and the Mauvaise Coulee. The bottom of the coulee is gravelly, covered with a soft muck of varying depths, and cat-tails and rushes are abundant on the shores. Above the coulee on old shore lines are woods of the usual type, favorable to the smaller land shells.

Lac aux Morts: A shallow lake of irregular outline, lying north of Devils Lake. Live snails in quantity were taken from marshes north of the lake and at one time undoubtedly a part of it.

Sweetwater Lake: The largest of the chain of lakes. It has a gravelly bottom and reeds and rushes along its edges. The water is slightly alkaline. It is probable that further collecting will add several species to the list from this lake.

Stump Lake: This is of the same character as Devils Lake, decidedly alkaline and devoid of mollusks. A small fresh pond at the south end of the lake, near a spring, was a suitable habitat for two species of snails, *Lymnaea palustris* and *Planorbis parvus*.

Sheyenne River: Collections were made at several points south of Devils Lake, where the stream is narrow and lies in the old valley, wide and deep with steep sides. The current is swift, and deep holes alternate with rocky rapids and shallow sand-bars. *Sphaerium declive* lives on the bars, and clams inhabit the deeper places in soft bottom. The only live Ancylidae taken were found on stones and clam shells in this river.

Wood Lake: A small fresh lake near the Sheyenne River, similar in many respects to Court Lake but with a sandy bot-

tom. *Amnicola* occurs here, one of the few habitats for that genus.

#### THE TURTLE MOUNTAINS

Upsilon Lake: In the eastern part of the mountains, not far from St. John. The water was thick and green with algae, and myriads of small crustacea swarmed on and about the bottom. Dead shells occurred in heaps, *Valkata tricarinata* being especially numerous, but few species were found alive in the lake. A new *Pisidium* (*P. apiculatum* Sterki, MS) was taken from the bottom in gravel a few feet from shore where the water was about two feet deep. The wooded shores are of the same type as those of Devils Lake.

Gravel Lake: Connected with Upsilon Lake and of somewhat the same character. The water was clear, however, and more live shells inhabited it. Dead clam shells were taken from the bottom, some in fairly good condition, but no live clams were seen. Water has been drawn off to supply the Fish Hatcheries, and it seems probable that this may have something to do with the decrease in the number of species living in the lake.

Lake Metagoshe: At the western edge of the mountains. A large shallow lake, the largest of the twenty-six lakes in the region. It resembles Upsilon in the character of the shores and in the gravel and marly bottom. The water was clearer, but had some of the same green algae. A stop here of a few minutes discovered only four species, but a more extended examination would probably result in a larger number.

Carpenter Lake: Of fair size, with reedy margin. Live snails of five species occurred in numbers.

Miscellaneous localities: North of Bottineau a few snails were taken from a spring brook flowing south. At Kelvin, north of Dunseith, some shells were taken from debris at the

edge of a small pond, one of the many lakes drying up year by year. *Planorbis altissimus* and small broken *Pisidia* were the only mollusks. Near Dunseith a spring-hole, a mere pocket of mud, perhaps a yard wide and as deep, was inhabited by *Lymnaea palustris*.

#### WESTERN NORTH DAKOTA

The topography and geological structure of this part of the state is adequately dealt with in the State Geological Survey.<sup>6</sup> It is unnecessary to describe it in detail since the material from the Little Missouri River at Medora, and the Missouri at Williston and Buford, was all drift debris taken from the banks of the rivers, and might have come from a long distance. A few *Lymnaea caeperata* were collected from a small coulee at Williston.

#### NOTES ON SPECIES

*Vitrina alaskana* Dall. Devils Lake, Upsilon Lake, Gravel Lake. These are all either young live shells, or old and imperfect specimens. Adult live shells might be secured later in the season. There seems to be little specific difference between this and *V. limpida* Gould.

*Vitrea hammonis* (Ström) (= *radiatula* Alder). Devils Lake, Stump Lake, Upsilon Lake, Gravel Lake.

*Vitrea binneyana* (Morse). Devils Lake. A few shells have been doubtfully referred to this species, but may be variations of *hammonis*.

*Euconulus fulvus* (Müller). Devils Lake, Mauvaise Coulee, Sweetwater Lake, Medora.

<sup>6</sup> Leonard, A. G., The Geology of Southwestern North Dakota, . . . etc. *State Geological Survey of North Dakota*, 5th Biennial Report, 1908.

*Zonitoides arborea* (Say). Devils Lake, Court Lake, Mauvaise Coulee, Sweetwater Lake, Upsilon Lake, Gravel Lake.

*Zonitoides milium* (Morse). Devils Lake. Only two specimens, identified by Dr. Sterki.

*Zonitoides minuscula* (Binney). Medora, Williston, Buford. Evidently confined to the western part of the state.

*Agriolimax campestris* (Say). Devils Lake, Mauvaise Coulee, Sweetwater Lake, Upsilon Lake.

*Pyramidula cronkhitei anthonyi* Pilsbry. Devils Lake, Court Lake, Mauvaise Coulee, Sweetwater Lake, Upsilon Lake, Gravel Lake, Medora, Williston, Buford. An abundant species, especially in the wooded area above the Mauvaise Coulee.

*Succinea azara* Say. Devils Lake, Stump Lake, Sheyenne River. Only a few specimens, apparently distinct from *grosvenorii*.

*Succinea azara vermeta* Say. Big Mission Lake, Sweetwater Lake, Upsilon Lake.

*Succinea grosvenorii* Lea. Devils Lake, Fort Totten Lake, Big Mission Lake, Mauvaise Coulee, Medora, Williston. This was taken in many hot, exposed places, and seemed able to withstand long periods of dry heat.

*Succinea grosvenorii* Lea, var. Devils Lake, Court Lake, Fort Totten Lake, Upsilon Lake, Bottineau. "A very large and obese race or form of *S. grosvenorii*. It . . . agrees in color, texture and shape with certain lots from Colorado and elsewhere, which connect with *grosvenorii*." (Pilsbry.) Of these shells the largest measures 18:5 in altitude. The moist undergrowth of Sullys Hill woods seemed a particularly favorable habitat.

*Succinea haydeni* W. G. B. Big Mission Lake, Fort Totten Lake, Sweetwater Lake, Sheyenne River. The largest speci-



mens were taken from dead reeds and debris at the edge of Sweetwater Lake. The animal is very large and of a pale buff color.

*Succinea haydeni minor* W. G. B. Court Lake, Fort Totten Lake, Lac aux Morts, Upsilon Lake, Lake Metagoshe, Carpenter Lake, Bottineau. This may be only an ecological form of *haydeni*, according to Pilsbry. It is variable in outline and in the angle of the aperture.

*Gastrocopta armifera similis* Sterki. Mauvaise Coulee, Medora, Buford, Williston.

*Gastrocopta contracta* (Say). Wood Lake. A single specimen, from debris at the edge.

*Gastrocopta holzingeri* (Sterki). Devils Lake, Mauvaise Coulee, Medora, Buford, Williston.

? *Vertigo coloradense* Ckll. "Probably a form of *coloradense* Ckll., the same as I have from western Montana and nearly the same from Winnipeg" (Sterki.)

*Vertigo gouldii* (Binney). Devils Lake. A few examples only.

*Vertigo ventricosa elatior* Sterki. Upsilon Lake.

*Vertigo ovata* Say. Devils Lake, Court Lake, Lac aux Morts, Upsilon Lake, Gravel Lake. Those taken at Court Lake were found on a wet log half in the water.

*Vertigo* sp. Buford, Williston.

*Pupilla muscorum* (L.). Devils Lake, Court Lake, Mauvaise Coulee, Stump Lake, Medora, Williston. Extremely abundant wherever taken. Dr. Sterki notes that it is this species "with slight variation."

*Cochicopa lubrica* (Müller). Devils Lake, Court Lake, Mauvaise Coulee, Gravel Lake, Bottineau.

*Vallonia gracilicosta* Reinhard. Devils Lake, Mauvaise Coulee, Sweetwater Lake, Stump Lake, Upsilon Lake, Medora, Buford, Williston. Abundant everywhere in the woods. Sterki comments on the absence of *V. pulchella*, *costata* and *parvula*. Many bags of forest debris sorted in the laboratory failed to discover any of these species. Several other curious gaps are noticeable also: no *Gastrocopta pentodon*, *tappaniana*, *corticaria*, *Pyrramanidula alternata*, nor *Helicodiscus parallelus*.

*Vallonia perspectiva* Sterki. Devils Lake, Stump Lake, Mauvaise Coulee, Medora, Buford. Not so numerous as *gracilicosta*, but occurring with it.

*Carychium eriguum* (Say). Court Lake. Three specimens.

*Carychium exile canadense* Clapp. Court Lake, Upsilon Lake.

*Lymnaea caperata* Say. Devils Lake, Big Mission Lake, Mauvaise Coulee, ditch pond near Garske, Medora, Buford, Williston. The shells show considerable variation in proportions; some have long spires and short apertures, others are more rounded with shorter spires.

*Lymnaea bulimoides cockerelli* Pils. & Ferr. Medora. A few immature specimens from drift were so identified by Walker.

*Lymnaea dalli* Baker. Court Lake, Lake at Warwick. Taken from grass and marshy ground.

*Lymnaea obrussa erigna* Lea. Upsilon Lake, Gravel Lake.

*Lymnaea palustris* Müller. Devils Lake, Court Lake, Fort Totten Lake, Big Mission Lake, Mauvaise Coulee, Wood Lake, Lac aux Morts and nearby ditches and marshes, Sweetwater Lake, Stump Lake pond, Sheyenne River, Upsilon Lake, Gravel Lake, Lake Metagoshe, Carpenter Lake, Bottineau, Buford, Williston. The shells from ditches near Lac aux

Morts are large and malleated, those from Fort Totten Lake smaller, very fragile and regularly sculptured. The entire series exhibits a wide range of variation from long spired shells with flaring lip to short stumpy ones with lip regularly curved.

*Lymnaea stagnalis appressa* Say. Fort Totten Lake, Mauvaise Coulee, Lac aux Morts, Gravel Lake, Lake Metagoshe, Carpenter Lake, Bottineau. Very fragile shells were numerous at Fort Totten Lake. One from Gravel Lake may be referred to variety *perampla* Walker.

*Planorbis altissimus* Baker. Devils Lake, Fort Totten Lake, Big Mission Lake, Wood Lake, Sheyenne River, Upsilon Lake, Gravel Lake. Most of the *parvus*-like Planorbis have been referred to this species by Baker. It seems to be the common form found on the shores of lakes now too alkaline for mollusks.

*Planorbis antrosus striatus* Baker. Gravel Lake, Lake Metagoshe, Carpenter. None were found south of the Turtle Mountains.

*Planorbis circumstriatus* Tryon. Devils Lake. These were named by Walker, "*teste* Sterki."

*Planorbis deflectus* Say, var. Sweetwater Lake. Walker suggests that they be compared with *obliquus* De Kay. None of the shells taken in 1919 are this species, unless a few immature ones may be doubtfully referred to it.

*Planorbis excavatus* Say. Fort Totten Lake, Mauvaise Coulee, Wood Lake, Lac aux Morts, Upsilon Lake. These shells, especially the lot from Upsilon Lake, seem to intergrade with the variety *megas* Dall. The sculpture of raised revolving lines is particularly conspicuous.

*Planorbis parvus* Say. Lac aux Morts, pond south of Stump Lake, Williston. Those from Stump Lake pond are small and rather flat.

*Planorbis parvus* Say, var. Devils Lake, Mauvaise Coulee, Wood Lake, Lac aux Morts, Sweetwater Lake, Bottineau. "Very much larger than typical *parvus* and the aperture is somewhat differently shaped." (Baker.)

*Planorbis parvus walkeri* Vanatta. Lac aux Morts. Some of the shells from debris at the edge of the lake have the heavy lip characteristic of the variety, but they occur with the *Planorbis parvus* var. listed above, and seem in all respects to be only an ecological form due perhaps to an increase in the alkalinity of the water. Modifications in the shells of *P. trivolvis* from the same habitat may be due to the same cause.

*Planorbis trivolvis* Say. Mauvaise Coulee, Wood Lake, Sheyenne River, Upsilon Lake, Gravel Lake.

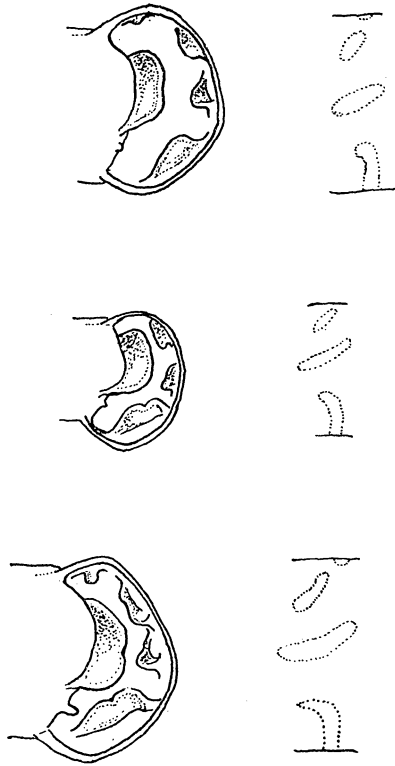
*Planorbis trivolvis* Say, var. Fort Totten Lake, Wood Lake, Gravel Lake, Carpenter Lake. Several varieties are included under this head. The shells from Fort Totten Lake have the flaring lip, covered with callus, that is characteristic of the variety *macrostomus* Whiteaves. Those from Lac aux Morts are small forms, a depauperate, misshapen race, closely coiled. In Gravel and Carpenter Lakes the upper whorls of the shells are rounded rather than carinated above.

*Planorbis umbilicatellus* Cockerell. Devils Lake, ditch north of Lac aux Morts. Typical shells were taken from meadows once a part of Devils Lake. The present localities are not far south of the original locality, Brandon, Manitoba.<sup>7</sup>

*Segmentina christyi* Dall. Mauvaise Coulee, ditch north of

<sup>7</sup> See Vanatta, E. G., The Geographic Distribution of *Planorbis umbilicatellus*. *Nautilus*, XXIV, 1911, pp. 136-138.

Lac aux Morts, pond two miles west of Garske. The record of this species from North Dakota connects the first United States record with the Canadian localities. Walker notes its occurrence in Deuel County, South Dakota, in 1910.<sup>8</sup> Since



Upper figures: *Segmentina armigera* Say.  
 Central figures: *Segmentina christyi* Dall.  
 Lower figures: *Segmentina crassilabris* Walker.  
 Outlines to the right indicate palatal lamellae as they appear through the shell.

that time no further records for the species have been published, so far as known. The snails were found alive in the

<sup>8</sup> Walker, Bryant., A new Species for the United States Fauna. *Nautilus*, XXIV, 1910, p. 11.

marsh ditch north of Lac aux Morts, some of the larger ones resembling at first glance a small *P. trivolvis*. Dead shells were abundant in the Mauvaise Coulee and in the pond two miles west of Garske, but no live ones were taken at either of those places. The largest specimen measures: greater diameter, 12.5 mm., lesser diameter, 11 mm., altitude, 3.5 mm.

The lamellae were compared with those of *Segmentina armigera* and *S. crassilabris*. The teeth of all three are figured, for comparison, drawn from camera lucida outlines. Only the young shells of *christyi* retain the lamellae, and none of them show an upper (4th) palatal. Even in very young shells it is absent. The lower palatal is bilobed as in *crassilabris*. The shells may also be distinguished in every case from *armigera* by the angle of the aperture, for whereas it is deflected downward in *armigera* it continues in the plane of the preceding whorls in *christyi*.

*Physa ampullacea* Gould. Devils Lake, Court Lake, Big Mission Lake, Wood Lake, Sheyenne River, Upsilon Lake, Gravel Lake, Carpenter Lake, Bottineau. The height of the spire varies somewhat, but most of the shells correspond essentially to the species as recently described and figured by Baker.<sup>9</sup>

*Physa integra* Hald. Sheyenne River. A few specimens only.

*Aplexa hypnorum tryoni* Currier. Mauvaise Coulee, ditch north of Lac aux Morts. Beautiful specimens were taken in quantity from the ditch. Many are of large size, measuring in altitude 24, 24.5, 25.5 mm. The shells are of a rich brown color, with a decided rose tint on the columella. The smaller form, *A. hypnorum*, occurred in the meadows north of the

<sup>9</sup> Baker, F. C., Freshwater Mollusca from Colorado and Alberta.

Biological Station. It is interesting to note that in 1920 no live snails were found in the ditch where they were so numerous in 1919.

*Ferrissia parallela* (Hald.). Court Lake, Carpenter Lake. A few dead specimens only. One from Court Lake is a curious "double-decked" shell.

*Ferrissia tarda* (Say). Sheyenne River. This seems to intergrade with the following *Ferrissia* sp.

*Ferrissia rivularis* (Say). Sheyenne River.

*Ferrissia* sp. Sheyenne River. "May be a depressed form of *tarda*." (Walker.)

*Valkata tricarinata* Say. Wood Lake, Upsilon Lake. Found in quantity in debris of Upsilon Lake. No live ones taken.

*Amnicola cincinnatiensis* (Anth.). Sheyenne River.

*Amnicola emarginata* Küster. Sheyenne River.

*Amnicola limosa porata* (Say). Wood Lake.

*Anodonta grandis* Say. Some are of a curious truncated form, rather heavy, and in outward appearance not unlike *Strophitus edentulus*.

*Anodonta pepiniana* Lea. Gravel Lake. Dead shells only.

? *Anodonta kennicotti* Lea. Gravel Lake. Walker suggests that this may be a large form of *pepiniana* and that the two intergrade.

*Lampsilis lutcola* Lam. Sheyenne River.

*Lasmigona compressa* (Lea). Sheyenne River.

*Sphaerium (aureum) declive* Sterki. Sheyenne River. "Same, apparently, as '*aureum declive*' of the Preliminary Catalog, from Illinois and westward. They were referred to *aureum* with doubts, and to judge from the good Sheyenne

River material, represent a distinct species, *declive*, of wide distribution, and rather variable." (Sterki.)

*Sphaerium sulcatum* (Lam.). Sheyenne River.

*Sphaerium* sp. Sheyenne River. "May be a form of *stamineum*." (Sterki.)

*Musculium jayense* (Prime). Sheyenne River.

*Musculium transversum* (Say). Sheyenne River.

*Musculium* sp. Mauvaise Coulee. "Apparently a species distinct from all described, at any rate markedly different, from *jayense*, *truncatum*, forms, and *ryckholti* Normand, the only ones which it somewhat resembles. May yet be a form (or forms) of *truncatum* Lins." (Sterki.)

*Pisidium apiculatum* Sterki (MS). Upsilon Lake. Found in gravel bottom a few feet from shore, where the water was from one to two feet deep. None were obtained from muddy or mucky bottom.

*Pisidium compressum* Prime. Sheyenne River, Upsilon Lake, Gravel Lake. "Exceptionally small form" from Upsilon Lake.

*Pisidium contortum* Prime. Gravel Lake.

*Pisidium pauperculum* Sterki. Gravel Lake.

*Pisidium tenuissimum* Sterki. Court Lake, Fort Totten Lake.

*Pisidium variabile* Prime. Gravel Lake.

*Pisidium variabile brevius* Sterki. Upsilon Lake.

*Pisidium vesiculare* Sterki. Court Lake.

*Pisidium* sp. Gravel Lake. "Apparently form of *tenuissimum*, very much like a form ('*calcareum*') so far found fossil (common) in marls of Maine, Michigan, and Illinois." (Sterki.)



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The following list is probably not complete, but may serve as an indication of the number of scattered publications on the region in which North Dakota lies. It does not include references already given in foot-notes of the present paper, nor on the related faunas of northern Michigan and Maine.

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