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PAPER 59-5

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IN SOUTHERN MANITOBA
62, 63, Parts of**

G. Winston Sinclair

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By

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Introduction

Rocks of Ordovician age are thought to underlie much of the basin of Lake Winnipeg and the valley of the Red River. Within this area they outcrop in four widely separated regions as follows:

1. South of Lake Winnipeg, Ordovician rocks are visible in small exposures in the Red River at Lockport, and in quarries in the Garson-Tyndall district nearby; they can also be seen in quarries at Stony Mountain, 25 miles west of Garson, and near Stonewall, 5 miles northwest of Stony Mountain.
2. From Hecla Island, 70 miles north of Garson, to the islands north of Dog Head, a distance of about 50 miles, exposures are fairly continuous along the west shore of the lake and on several adjacent islands.
3. About 40 miles farther north, Ordovician rocks are exposed on the islands off Berens River, on the west shore of the lake near Cat Head, and, according to reports, on the west shore of Sturgeon Bay.
4. From Selkirk Island 100 miles northwest of Cat Head, to Howell Point on the west side of the lake 20 miles to the north, small scattered exposures are known.

The rocks of this last, northerly region, now the least accessible, were the first to become known, for they lay on the old water route from Hudson Bay to the Saskatchewan River, and several early explorers brought back fossils which were described in Europe, by Stokes, Milne-Edwards, and others. As the Red River valley became settled, geological information accumulated, and by 1859 the distribution and nature of the Ordovician rocks were, in general terms known (Hind, 1859)¹. Modern knowledge dates from the report of Dowling (1900), which is so accurate and lucid that it is still the basis for all current work.

Since 1900, Okulitch (1943), Baillie (1952), Stearn (1956), and Professor Leith and his students at the University of Manitoba have added information on the stratigraphy. Much of the fauna was described by Whiteaves (1895, 1897) and Ulrich (1889). More recently Foerste (1929) has described cephalopods, named stratigraphic units, and discussed the broad regional implications of the faunas. In the course of their work Okulitch and Stearn collected additional faunas, and Leith and Sinclair described a few new forms in several short papers.

¹Names and dates in parentheses are those of references cited at the end of this report.

Present Work

In the autumn of 1954 a few days were spent examining beds near Winnipeg and Cat Head. This trip was made with A. D. Baillie, Curt Teichert of the U.S. Geological Survey, R. H. Flower of the New Mexico Bureau of Mines, and others, whose comments were very useful. Helen Zaborniak (Mrs. McCammon), then a student assistant with the Manitoba Department of Mines and Natural Resources, helped to collect fossils near Winnipeg.

The 1957 field season was devoted to further study of the region, when exposures in all parts of Lake Winnipeg except Sturgeon Bay were examined, and quarries near Winnipeg were restudied. This work was done with the kind cooperation of G. H. Charlewood and J. F. Davies, successive chief geologists of the Mines Branch, Manitoba Department of Mines and Natural Resources, and their staffs. Richard Sutton of the Manitoba Museum, Professor Leith, and local fossil collectors, especially Percy Stokes, were also very helpful.

Although many problems remain to be solved by further field work and intensive palaeontological studies, the succession of Ordovician formations now seems clear, and it is presented here in preliminary form.

History of Current Names

Dowling (1900, p. 35F) summarized his ideas concerning the stratigraphy of the Ordovician of Manitoba in the following section:

Stony Mountain formation	Limestones and shales
Utica?	
Trenton formation	Upper Mottled limestone
	Cat Head limestone
	Lower Mottled limestone
Black River ? formation	Winnipeg sandstone and shales

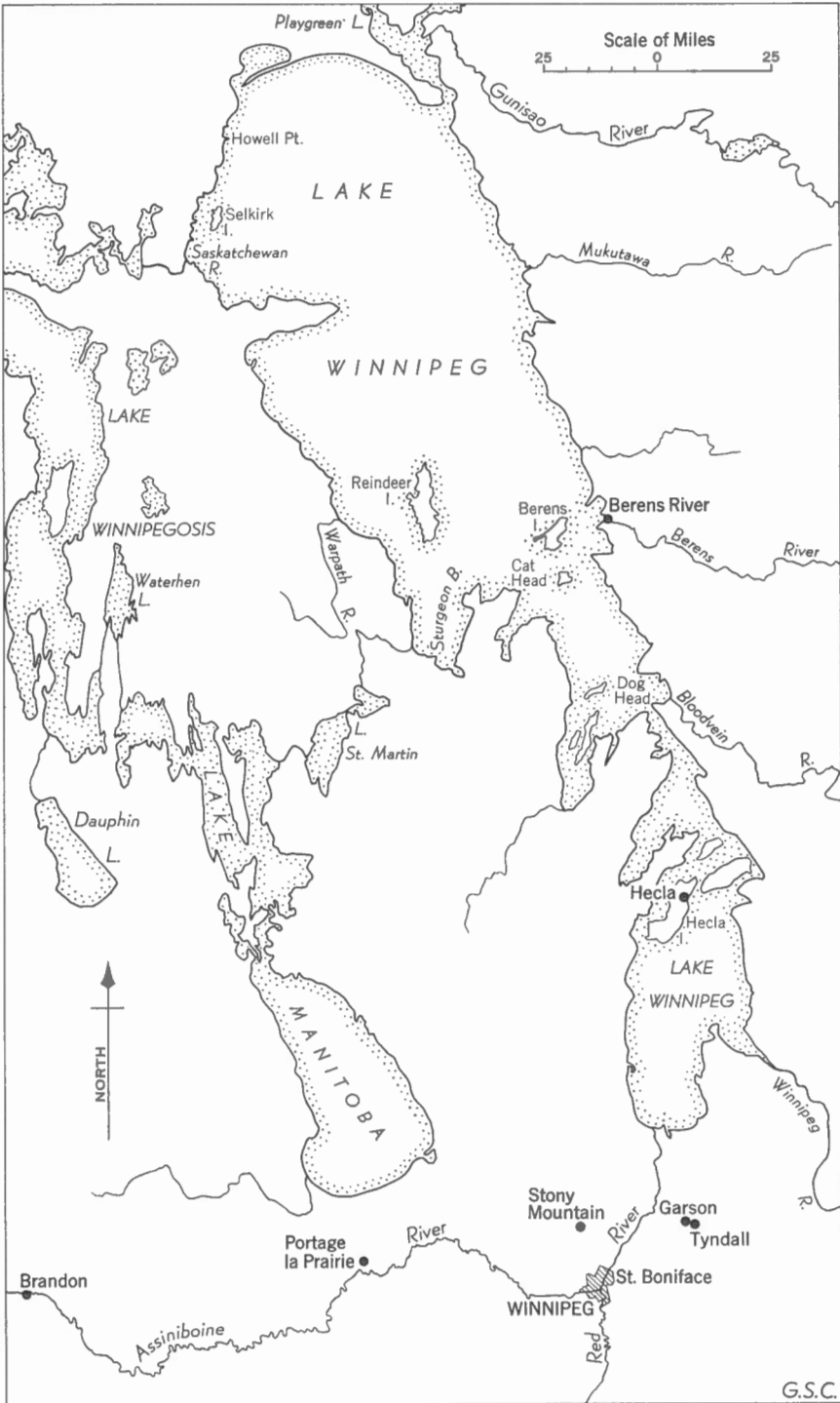


Figure 1. Index map of Lake Winnipeg region showing localities mentioned.

The relative position of the "Trenton" units was established in the northern part of the lake (regions 3 and 4 above), where the regional dip is westerly off the Precambrian and where the Lower Mottled, Cat Head, and Upper Mottled were found to outcrop in this order from east to west. No one exposure affords a section, nor any unequivocal contact, and most show only a few feet of beds. In these regions the Lower Mottled beds are the lowest seen, but there is room for an unexposed basal sandstone in the channel between Berens Island (Lower Mottled) and Berens River (Precambrian). Dowling did not recognize any post-Trenton Ordovician in the northern part of the lake.

In the region between Hecla Island and Dog Head the contact of the Lower Mottled limestone on the underlying Winnipeg sandstones is widely exposed, but no younger beds are visible.

South of Lake Winnipeg, where exposures are thin and widely separated, Dowling recognized the Stony Mountain shales and limestones as being post-Trenton, and identified the quarry beds at Garson-Tyndall as being his Upper Mottled limestone. In neither of these districts are any contacts visible.

The section tabulated above remained unchanged until Foerste, who, although he did not visit Manitoba, introduced new geographic names for Dowling's units. The following is the section as modified by Foerste (1929, p. 130):

Stony Mountain formation	
Red River formation	Selkirk limestone
	Cat Head limestone
	Dog Head limestone
Winnipeg sandstone	

Recent work by Okulitch (1943), Baillie (1952), Stearn (1956), and by Sinclair and Leith (1958) has introduced new concepts and names in the upper part of the section, and Genik (1954) has subdivided the lower, until the following is now the accepted section:

Stonewall formation	
Stony Mountain formation	Gunton member Penitentiary member Gunn member
Red River formation	Selkirk member Cat Head member Dog Head member
Winnipeg formation	Deer Island member Black Island member

Revision of "Red River Formation"

Although many workers have written about the Manitoba Ordovician, apparently none since Dowling have visited the exposures in the northwest corner of the lake, the only region where there is stratigraphic evidence for the position of the Upper Mottled limestone. For the past 60 years all discussion of the Upper Mottled and Selkirk beds has been based on the readily accessible quarries at Garson-Tyndall, and the published statements about the character and fauna of the Selkirk have been based on this district.

As this Selkirk fauna became better known, it became clear that it strongly resembles the Dog Head member. Recent work has shown, indeed, that the two are essentially identical, in spite of a slight difference in aspect between the Selkirk and Dog Head beds. The Garson-Tyndall quarry beds are massive fragmental limestones, irregularly dolomitized, with an abundance of well-preserved fossils. The Dog Head consists of thinner bedded limestones with dolomite mottling, with fossils always rare and poorly preserved. To offset this lack of specimens, the exposures are vast, and with sufficient time and effort large collections could be made. The reason for this resemblance of the Selkirk to the Dog Head faunas was not determined until the original Upper Mottled limestone was seen in place.

The Upper Mottled limestone of Dowling, as exposed north of the Saskatchewan River, which overlies the Cat Head

member, contains the fauna not of the Selkirk, but of the Stony Mountain. Detailed palaeontological work is needed before this conclusion can be documented properly, but the relationship seems clear on the basis of first determinations. Indeed, although positive correlation with any particular part of the Stony Mountain formation must await this detailed study, the negative statement, that the fauna is not that of the Selkirk, can be made with assurance. Once this fact is recognized, many otherwise puzzling facts are seen to have simple explanations.

Once it is seen that the Selkirk member does not necessarily overlie the Cat Head member (there was never any evidence for this apart from the assumed correspondence of the former with the Upper Mottled limestone) it can be recognized for what it is, the southern extension of the Dog Head. It is on strike with the Dog Head, a fact otherwise difficult to explain, and contains the same fossils.

The apparent northward disappearance of the Stony Mountain formation is explained. It does not disappear. It simply becomes less shaly to the north, as apparently it also does where traced to the west in the subsurface.

The presence of a series of fine-grained dolomites and evaporites at the top of the Red River formation in the subsurface agrees with the surface evidence that the Cat Head member, with its peculiar aphanitic dolomites and limestones and its unique fauna and flora, forms the upper part of the Red River formation with no overlying fragmental beds.

If the Dog Head and the Selkirk are the same, as has been suggested, what should they be called? The exposures in the Garson-Tyndall quarry district, and in the Red River valley near Selkirk (whence the name Selkirk), are the best known and most readily available for study of all the Middle Ordovician outcrops in Manitoba. But the name Selkirk has the disadvantage that for a generation it has been thought of as applying to beds younger than Cat Head. The name Dog Head has always been used with the proper stratigraphic meaning, and is therefore preferred here.

The Cat Head is sharply set off from beds both above and below in lithology, and also in fauna and flora. Both it and the Dog Head might well be treated as formations, but are here considered as members of the Red River formation so that current names may be disturbed as little as possible.

For the original Upper Mottled limestone, now thought to be of Stony Mountain age, no harm can arise if for the present it is referred to as Stony Mountain formation.

The sandstones and shales below the Dog Head member have not been studied in detail as the published accounts seem to be adequate. The fossils that have been reported from the upper part of the Winnipeg sandstones (the lower part is barren) are so much like those of the Dog Head member that it seems simplest to interpret the Winnipeg as a local basal unit with the same age as the Dog Head. Correlation with basal sandstones in other regions would not be expected.

Revised Sequence of Ordovician Rocks in Manitoba

Stonewall formation		Dolomite
Stony Mountain formation	Gunton member	Dolomite
	Penitentiary member	Argillaceous dolomite
	Gunn member	Calcareous shale
Red River formation (group)	Cat Head member	Aphanitic limestone and dolomite, with chert
	Dog Head member	Fragmental limestone with dolomite mottling
Winnipeg formation		Sandstone and shale

Subsurface Ordovician

Although this paper is concerned only with describing the sequence of rocks as seen in their areas of outcrop, mention should be made of recent important work on the beds found in subsurface explorations to the west by Ross (1957), and Porter and Fuller (1959), and summaries of data by Cumming and others (1958).

Ross found the existing terminology sufficient for his purposes; he merely combined an expanded Stony Mountain formation and Red River formation into a new group which he named the Bighorn Group. If for some purposes a group term seems desirable for the Ordovician formations considered together, this would seem to be an acceptable name.

Porter and Fuller recognized a twofold division of their Red River formation, and I think it will be found that their upper

division agrees well with the Cat Head member, and their lower division with the Dog Head member, as here used.

Cumming and others provide new names which may be useful in describing subsurface materials, but in the outcrop areas at least, these names seem to be redundant.

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