The Matagamon Sandstone—A New Devonian Formation in North-Central Maine

By D. W. RANKIN

CONTRIBUTIONS TO STRATIGRAPHY

GEOLOGICAL SURVEY BULLETIN 1194-F

UNITED STATES DEPARTMENT OF INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

Thomas B. Nolan, *Director*

The U.S. Geological Survey Library has cataloged this publication as follows:

Rankin, Douglas Whiting, 1931–

The Matagamon Sandstone, a new Devonian formation in north-central Maine, by D. W. Rankin. [Washington, U.S. Govt. Print. Off., 1965]

iii, 9 p. illus., maps. 24 cm. (U.S. Geological Survey. Bulletin 1194–F)

Contributions to stratigraphy.

Bibliography: p. 9.

1. Sandstone—Maine. 2. Geology—Maine—Penobscot Co. 3. Geology, Stratigraphic—Devonian. I. Title. (Series)

U.S. GOVERNMENT PRINTING OFFICE : 1965

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 10 cents (paper cover)

CONTENTS

ILLUSTRATIONS

CONTRIBUTIONS TO STRATIGRAPHY

THE MATAGAMON SANDSTONE—A NEW DEVONIAN FORMATION IN NORTH-CENTRAL MAINE

By D. W. RANKIN

ABSTRACT

The Matagamon Sandstone is a thick clastic unit of Becraft and Oriskany (Early Devonian) age in northern Penobscot County, Maine. The type section is on Hay Mountain, east of Grand Lake Matagamon from which the sandstone takes its name. Thick-bedded rusty-weathering sandstone constitutes about 80 percent of the unit. Dark slate and siltstone make up the remainder. The Matagamon is at least 4,000 feet thick and is interpreted to be a sandstone lens equivalent to the upper part of the slaty Seboomook Formation.

INTRODUCTION

A thick clastic unit, predominantly sandstone, forms a mappable unit in northern Penobscot County, Maine. The sandstone is well exposed at Stair Falls on the East Branch of the Penobscot River, around the southernmost shores of Grand Lake Matagamon, and on Hay Mountain in the Traveler Mountain and Shin Pond quadrangles (figs. 1 and 2). Although these rocks have been known for 100 years, neither their extent nor their relationship to surrounding rocks has been determined. Clarke (1909, p. 64) in his compendium on the Early Devonian of eastern North America included these rocks in the Moose River Sandstone. Boucot (1961, p. 160) redefined the Moose River in the type area west of Moosehead Lake in Somerset County and gave it group status. He further specifically excluded the sandstone at Grand Lake Matagamon from the Moose River Group on the premise that the sandstones in the two areas were probably never continuous with one another. In this paper the lithology and geologic setting of the unit are described in greater detail than has been done heretofore and a local name for the Lower Devonian sandstone unit of northern Penobscot County is introduced.

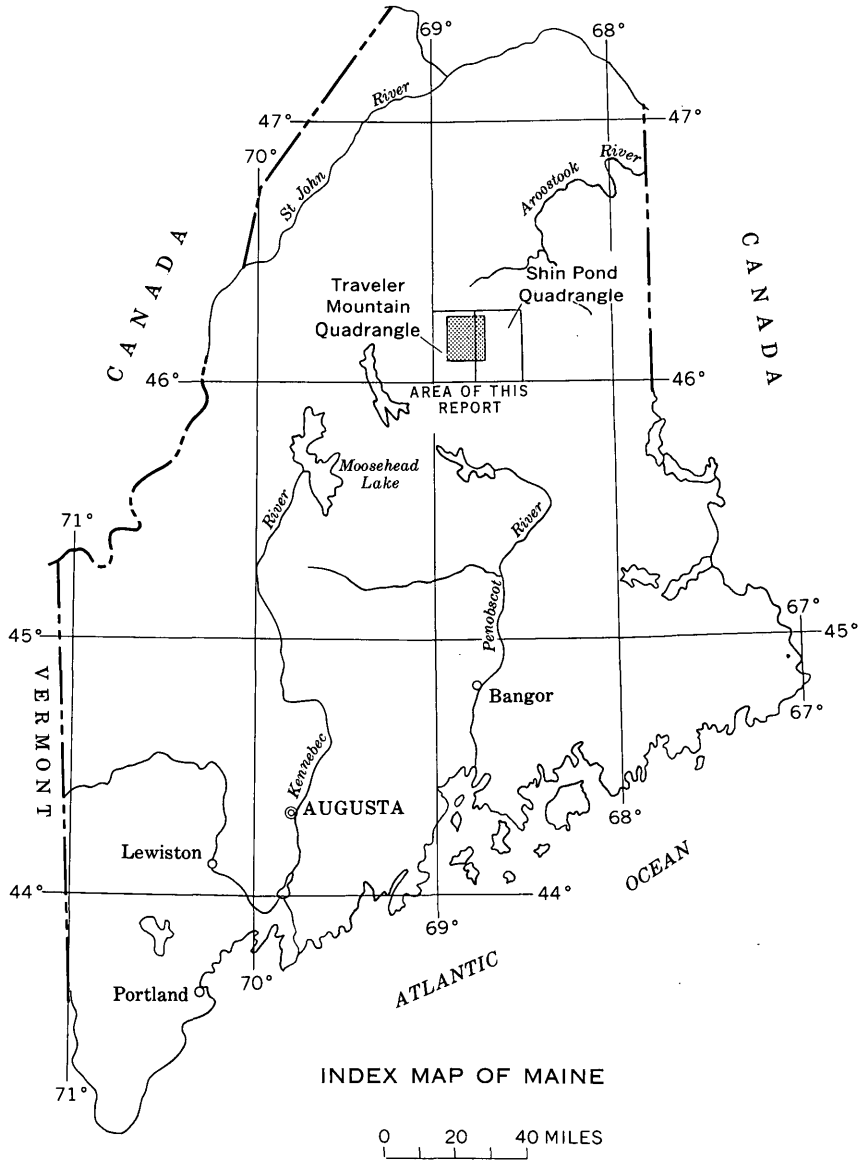

FIGURE 1.—Area of geologic map.

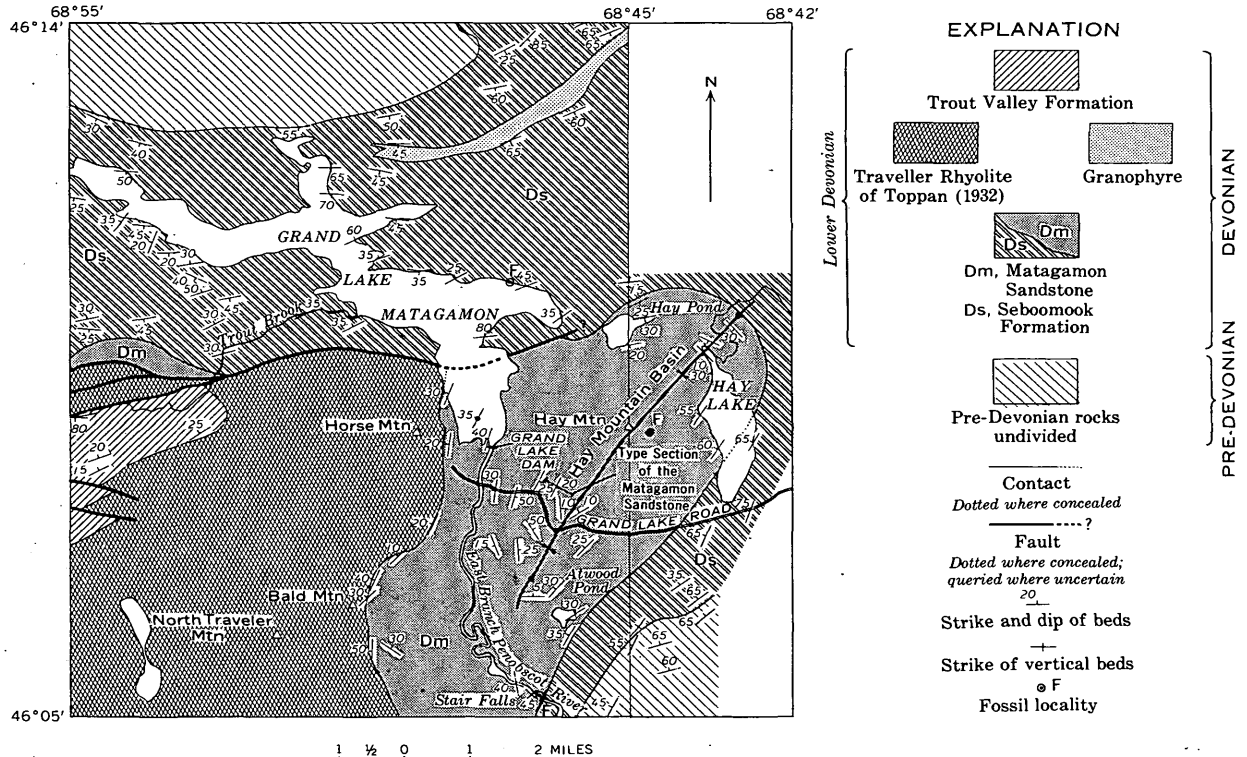

FIGURE 2.—Geologic sketch map of the Hay Mountain area, north-central Maine showing the type area of the Matagamon Sandstone.

The sandstone was studied and its boundaries mapped as a part of a thesis project supported by Harvard University and the Maine Geological Survey during the summers of 1955, 1956, and 1957. The work was an integral part of the mapping of northern Maine, which was supported in part by the U.S. Geological Survey. A. J. Boucot identified the fossils and contributed many of the ideas pertaining to Lower Devonian stratigraphy in northern Maine.

PREVIOUS WORK

The sandstone was first noted by C. H. Hitchcock (1861), geologist of the first formal scientific party to traverse the area. Although Hitchcock correctly recognized Early Devonian fossils in the sandstone of the East Branch area, he concluded that this sandstone was not part of the same unit as the sandstone of the Moosehead Lake area. "The rock [East Branch] is a loosely cemented sandstone, very much like the Oriskany Sandstone of New York, but totally unlike the Oriskany Sandstone of Maine [Moosehead Lake], as already described" (Hitchcock, 1861, p. 403). On the geologic map accompanying Hitchcock's report, the sandstone in the Moosehead Lake area is shown as "Oriskany Sandstone" and that in the East Branch area as "Devonian Rocks." Williams (1900, p. 88) first used the name Moose River Sandstone for the "Oriskany Sandstone" of Somerset County, and in 1903 Clarke extended the Moose River to include the sandstone unit in northern Penobscot County.

NAME, LITHOLOGY, AND THICKNESS

The name Matagamon Sandstone is herein given to the rocks, predominantly sandstone but with minor interbedded slate, exposed on Hay Mountain and at the south end of Grand Lake Matagamon. The type section of the formation is on the west slope of Hay Mountain, north of Grand Lake Road, as indicated on figure 2. The type section begins in a gully between two prominent strike ridges that are 900 feet N. 25° E. of the major sharp corner concave to the southwest on the Grand Lake Road. The section runs S. 70° E. and ends at the southwesternmost 1,060-foot summit of the Hay Mountain ridge. As thus defined, the type section extends about 2,700 feet along the west slope of Hay Mountain and contains a 1,000-foot thickness of the Matagamon Sandstone. The lower quarter of the section is exposed in open pavementlike ledges, where sandstone outcrops constitute about 80 percent of the traverse. Above this, the rocks are soil covered and exposures are poor, constituting no more than 5 percent of the traverse. This part of Hay Mountain is chosen for the

type section because of the pavementlike exposures. Unfortunately, because of structure and erosion, neither the bottom nor the top of the formation is included in the section at this locality. The lower part of the Matagamon Sandstone is well exposed at Stair Falls on the East Branch and around the shores of Atwood Pond. The upper part of the formation is exposed in scattered outcrops between Grand Lake Matagamon and the cliffs of felsite on Horse Mountain.

Thick-bedded rusty-weathering sandstone characterizes the Matagamon sandstone. An indeterminate but minor amount of dark slate and argillaceous siltstone is interbedded with the sandstone. Except in certain roadcuts and streamcuts such as Stair Falls, the slate is poorly, if at all, exposed. The Matagamon terrane is characterized by low hogback ridges of sandstone that show up strikingly on aerial photographs (fig. 3). The valleys between the ridges probably contain a higher percentage of slate, but by comparison with the lower part of the type section, sandstone is estimated to compose at least 80 percent of the formation as a whole.

The sandstone is hard, and free slabs of it ring with a distinctive tone when struck with a hammer. The sandstone is typically fine grained and slightly calcareous. The color is medium bluish gray or greenish gray on the fresh surface. Beds are of varied thickness, ranging from less than an inch to 10 feet. Beds 3 feet thick are common. Crossbedding is generally present. Ripple marks, load casts, sideritic concretions, and clay pellets also occur. The concentration of clay pellets along certain bedding planes suggests that the breakup of an unconsolidated silt or clay layer occurred during or just prior to the deposition of the overlying sand. Fossil fragments, both invertebrates and plant material, are common. The invertebrate fossils may be concentrated in shell beds.

Detrital grains are angular to subangular. Typical sandstone contains 10 percent or less feldspar, and about one third of the detrital grains are rock fragments. The amount of "clay" matrix in the sandstone ranges from less than 10 percent to about 25 percent. Thus, depending upon the amount of "clay" matrix, the sandstone falls into the lithic graywacke or the lithic sandstone (subgraywacke) classification of Pettijohn (1957, p. 291). Much of the former "clay" matrix now consists of chlorite and muscovite.

The Matagamon Sandstone in northern Penobscot County is in the chlorite zone of regional metamorphism. Axial-plane cleavage is well defined in the slate but not in the sandstone. Jointing, generally planar, is conspicuous in some exposures of sandstone. Many of the joints are lined with quartz and (or) calcite; irregular quartz veinlets are common. The thicker beds of the Matagamon Sandstone have a

tendency to break into curving slabs along nonplanar and nonparallel joints at high angles to the bedding. Such curving slabs litter the terrane underlain by the formation and form great piles that presumably represent the breakup of outcrops in place.

Much of the Matagamon Sandstone crops out in a northeast-trending structural basin on Hay Mountain, herein called the Hay Mountain basin (fig. 2). Strike ridges closing the northeast end of the basin are clearly visible on figure 3. As determined from the width of the outcrop belt between the Seboomook Formation on Hay Lake and the axis

FIGURE 3.—Aerial view of low ridges parallel to the strike of beds of the Matagamon Sandstone. At the upper right, ridges reflect the sandstone strata wrapping around the northeast end of the Hay Mountain basin. Grand Lake Matagamon appears at the left edge of the photograph, Hay Lake at the right. Hay Pond at the top center is 0.8 mile in longest dimension.

of the Hay Mountain basin, the Matagamon Sandstone must be at least 4,000 to 5,000 feet thick. The top of the unit is not exposed there.

LOWER AND UPPER CONTACTS

The Matagamon Sandstone rests conformably upon a thick monotonous clastic unit characterized by thin graded beds of dark slate and lighter colored sandstone. The underlying unit, in which slate predominates, is mapped as the Seboomook Formation as redefined by Boucot (1961, p. 169). The Seboomook Formation grades into the overlying Matagamon Sandstone. The transition zone is characterized by an increase in the percentage of sandstone and by an increase in the thickness of the sandstone beds. As the thicker sandstone beds become more numerous, crossbedding rather than graded bedding characterizes the rocks. The contact between the formations is arbitrarily drawn where thick-bedded sandstone constitutes more than 50 percent of the rocks. The transition zone, as exposed south of Atwood Pond and on the west shore of Hay Lake, is a few hundred feet thick.

The Matagamon Sandstone is conformably overlain by the Traveller Rhyolite of Toppan,[1] a thick sequence of lava and ash flows (Rankin, 1960). The contact is gradational over a few feet and is well displayed at the base of the cliffs on Horse and Bald Mountains. At both localities, a sharp contact separates massive felsite containing no interbedded sedimentary rocks from underlying obviously stratified rocks (fig. 4). This contact is defined as the base of the Traveller Rhyolite. It does not, however, represent the onset of volcanism, for sparse felsite pebbles appear in the uppermost sandstone and slate of the Matagamon. Above the first appearance of felsite pebbles, beds of tuffaceous sandstone and felsitic crystal tuff occur locally. There is, thus, a transition zone, perhaps 20 feet thick of intermixed detrital and volcanic material between the normal sedimentary rocks of the Matagamon and the massive felsite of the Traveller Rhyolite.

AGE AND CORRELATION

An Early Devonian [Oriskany] age of the Matagamon was first suggested by Hitchcock (1861). This age was confirmed and the faunal assemblage amplified by Clarke (1909, p. 64 and 65). Recently, Boucot (in Boucot and others, 1963, p. 113) described a new species of Brachiopoda, *Cloudella matagamoni* Boucot, from sandstone in the area of Grand Lake Dam. The writer made a small collection of fossils from the lower Stair Falls on the East Branch. The collection

[1] Toppan, F. W., 1932, The geology of Maine: Master's thesis, Union College, Schenectady, N.Y., 141 p.

includes the brachiopods *Leptocoelia* cf. *L. flabellites*, *Leptostrophia*? sp., and *Meristella* sp., which suggest a Becraft and Oriskany age (A. J. Boucot, written commun., April 1961). A later and larger collection from the Matagamon was made by R. B. Neuman from just east of the summit of Hay Mountain (fig. 2). The following fossils in this collection were identified by Boucot (written commun. to R. B. Neuman, July 16, 1962):

Acrospirifer sp.
Beachia sp.
"Chonetes" canadensis Billings
Coelospira dichotoma (Hall)
Costellirostra sp.
Cyrtina sp.
Leptocoelia flabellites (Conrad)
Leptostrophia magnifica (Hall)
Meristella arcuata (Hall)

FIGURE 4.—Conformable contact between breccia of the Traveller Rhyolite of Toppan (1932) and tuffaceous sandstone on the east side of Bald Mountain. The breccia forms the overhang.

Boucot further stated, "[This collection] is of Becraft-Oriskany age as shown by the presence of *Beachia* in association with a number of Becraft-Oriskany type genera and species. This is a direct correlative of the Tarratine Formation." The Tarratine, largely sandstone, is the lower division of the Moose River Group (Boucot, 1961).

Lower Devonian sandstones in northern Maine tend to occur in isolated patches in a terrane of finer grained clastic sedimentary rocks (Boucot and others, 1960). In the Moose River synclinorium, the Tarratine Formation grades laterally into pelitic sediments of the Seboomook Formation. In the Hay Mountain basin, the Matagamon Sandstone overlies the Seboomook, but it probably extended beyond its present outcrop area as fingers of sandstone intercalated with the Seboomook. Northwest of Trout Brook at the west edge of the map area (fig. 2), the Matagamon is present and is in fault contact with the Traveller Rhyolite of Toppan. The contact between the Matagamon and Seboomook is not exposed. On the basis of available structural data, two alternatives are possible: the contact could be a normal stratigraphic one or the Matagamon could grade laterally into the Seboomook. The second is the writer's interpretation. Fossils of Becraft and Oriskany age, identified by A. J. Boucot, were collected by the author in the Seboomook Formation on the north shore of Grand Lake Matagamon. The paleontologic evidence is consistent with a lateral gradation. The Matagamon Sandstone is therefore considered to be a sandstone lens similar to the Tarratine Formation and equivalent to the upper part of the Seboomook Formation.

REFERENCES

Boucot, A. J., 1961, Stratigraphy of the Moose River synclinorium, Maine: U.S. Geol. Survey Bull. 1111–E, p. 153–188.

Boucot, A. J., Caster, K. E., Ives, David, and Talent, John A., 1963, Relationships of a new Lower Devonian terebratuloid (Brachiopoda) from Antarctica: Bull. Am. Paleontology, v. 46, no. 207, p. 81–151.

Boucot, A. J., Griscom, Andrew, and Allingham, J. W., 1964, Geologic and aeromagnetic map of northern Maine: U.S. Geol. Survey Geophys. Inv. Map GP–312.

Clarke, J. M., 1909, Early Devonic history of New York and eastern North America: New York State Mus., Mem. 9, pt. 2, 250 p.

Hitchcock, C. H., 1861, Geology of the Wild Lands, *in* Holmes, Ezekiel, and Hitchcock, C. H., Preliminary report upon the natural history and geology of the State of Maine: Maine Board Agriculture 6th Ann. Rept., p. 377–442.

Pettijohn, F. J., 1957, Sedimentary rocks: New York, Harper and Bros., 718 p.

Rankin, D. W., 1960, Paleogeographic implications of deposits of hot ash flows: Internat. Geol. Cong., 21st, Copenhagen 1960, Rept., pt. 12, p. 19–34.

Williams, H. S., 1900, The Paleozoic faunas of Maine *in* Williams, H. S., and Gregory, H. E., Contributions to the geology of Maine: U.S. Geol. Survey Bull. 165, p. 15–92.