

THE GRAND PITCH FORMATION: NEW NAME FOR THE GRAND FALLS FORMATION (CAMBRIAN?) IN NORTHEASTERN MAINE*

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ABSTRACT. The name Grand Pitch Formation is proposed to replace the name Grand Falls Formation of Ruedemann and Smith (1953). The type section at Grand Pitch of the East Branch of the Penobscot River, Penobscot County, Maine, consists of quartzite and slate, interbedded in varying proportions, and contains red slate with *Oldhamia smithi* Ruedemann. No other fossils have been found in the formation. Geologic relations suggest that the Grand Pitch Formation may be as young as Early Ordovician, but it could be as old as late Precambrian.

One of the few stratigraphic names overlooked by Miss M. Grace Wilmarth in her monumental *Lexicon of Stratigraphic Names of North America* (1938) was the Grand Falls Formation of Ruedemann and Smith (1935, p. 354) in northern Penobscot County, northeastern Maine. As a result of this omission an homonymy has persisted for many years, as the name Grand Falls had been preoccupied for a chert of Mississippian age in Missouri (Grand Falls chert of Winslow, 1894, p. 417-419). This was pointed out in a recent progress report (Neuman, 1960), but no revision of the name was proposed in that report.

The Grand Pitch Formation is here proposed for use in Maine, with its type section designated to be the exposures in the immediate vicinity of the Grand Pitch of the East Branch of the Penobscot River (fig. 1). The type locality is thus more specifically located than that originally indicated by Ruedemann and Smith (1935, p. 354), for Grand Pitch is one of the series of waterfalls included in the Grand Falls (Hitchcock, 1861, p. 401). Younger formations exposed at the more northerly of the Grand Falls, from Pond Pitch northward, are thus excluded from the type Grand Pitch (Rankin, 1960, p. 30).

Virtually continuous bedrock exposures line the river banks for about 1000 feet in the vicinity of Grand Pitch. They consist of steeply dipping quartzite and slate interbedded in varying proportions. At the steepest part of the falls the rock is light greenish-gray, fine-grained quartzite in massive beds from 6 inches to 4 feet thick, separated by thinner layers of light greenish-gray and medium-gray slate, which here forms no more than 20 percent of the section. In adjacent exposures, both upstream and downstream, slate is more abundant and quartzite beds are thinner. Some quartzite beds, a few hundred feet upstream from the falls, preserved flow casts on their bottom surfaces. Downstream, within 500 feet of the falls, green and red slate is interbedded with quartzite, much of which is thin bedded and has crossbedding on a small scale. One layer of red slate here contains abundant specimens of *Oldhamia smithi* Ruedemann (fig. 2), like those reported from Bowlin Falls farther downstream by Smith (1928).

The complex structure of these rocks has prevented determination of the stratigraphic succession within them. The beds at Grand Pitch are nearly vertical; several tightly compressed folds are apparent, and a steep fault of unknown displacement cuts across the thick-bedded quartzite at the main falls.

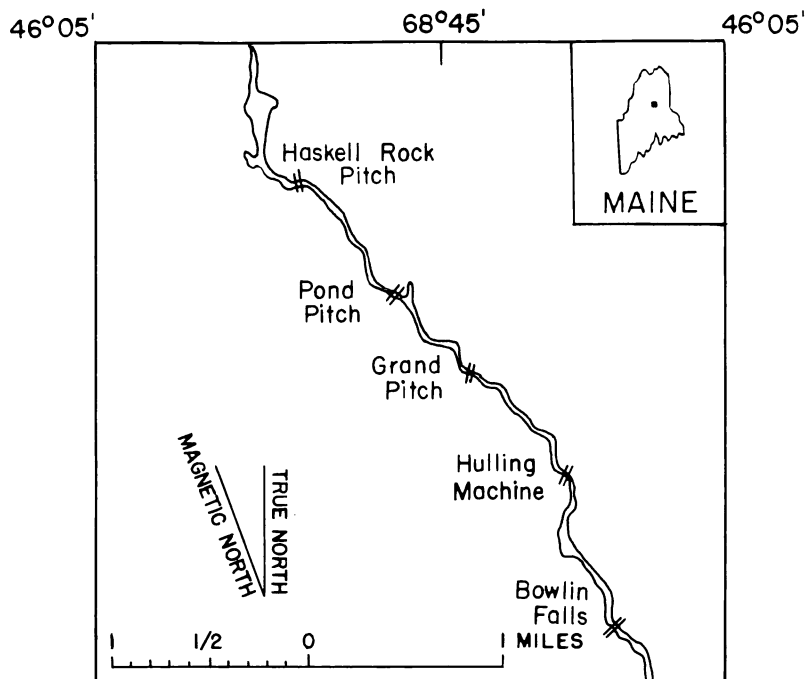


Fig. 1. Map of a part of the East Branch of the Penobscot River, showing location of Grand Pitch and other waterfalls nearby. Planimetry from U. S. Geological Survey Traveler Mountain and Shin Pond 15-minute topographic quadrangles; locations of waterfalls from aerial photographs.

Geologic mapping of the Shin Pond quadrangle (Neuman, 1960) has shown that the Grand Pitch Formation is a readily mappable unit probably several thousand feet thick, with little variation over many square miles. Fossils other than *Oldhamia* have yet to be found in it. The mapping has not disclosed the base of the formation, but it has revealed an angular unconformity at the formation top in several places. In one segment of exposure the Grand Pitch is overlain by Ordovician tuffs, and in others it is overlain by Ordovician basalt, and by a variety of Silurian sedimentary rocks.

The age of the Grand Pitch Formation can be set only within broad limits. It cannot be younger than the Ordovician tuffs that overlie it, but its maximum age can only be inferred from the *Oldhamia*. Earlier, Smith (1928) suggested a Cambrian age for these rocks, based on the occurrence of *Oldhamia*.

Several problems attend the use of *Oldhamia* as an index of Cambrian age. Objects classed under this name vary greatly in pattern; although most of these are likely to be of organic origin, the nature of the organism that made them remains obscure. Ruedemann's (1942a, p. 9) interpretation that they are the intrastratal feeding tracks of worms comparable to *Chondrites* is tenable. Previous descriptions have failed to note that the trails are raised ridges

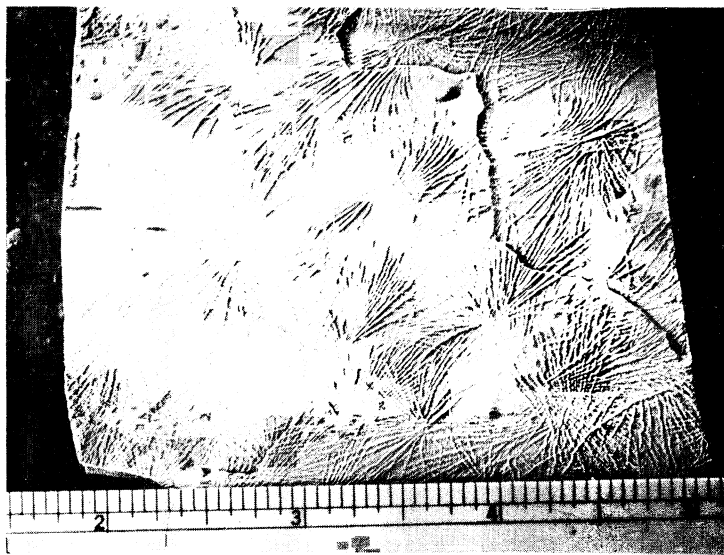


Fig. 2. *Oldhamia smithi* Ruedemann, X 1, from red slate in the Grand Pitch Formation, about 500 feet SE of Grand Pitch of the East Branch of the Penobscot River. Upper surface of a bed with several specimens. The imprints of some specimens of one layer are preserved in the succeeding layer, about 0.1 mm thick. The dimples are the sites of pyrite crystals. U. S. N. M. 139806.

on the upper surfaces of bedding planes (or grooves on lower surfaces), a fact consistent with the feeding track interpretation.

Several formations have been dated as Cambrian solely on their content of *Oldhamia*, and better known kinds of fossils have yet to be recovered from them. These formations may be as old as late Precambrian; the Nassau Formation in eastern New York, for example, which yielded the first specimens of *Oldhamia* to be found in North America (Walcott, 1894), lies several hundred feet below beds with Early Cambrian trilobites, and, like the Grand Pitch Formation, is the oldest formation exposed in the area (Billings, Rodgers, and Thompson, 1952, p. 37). On the other hand, a somewhat dissimilar form of *Oldhamia* has been reported from Ordovician rocks in Quebec (Ruedemann, 1924b), and Rusconi (1956) reported but did not illustrate one from the Ordovician of Argentina.

The Grand Pitch Formation may therefore be as young as Early Ordovician, but is probably no older than late Precambrian. It is here classed as Cambrian?

REFERENCES

- Billings, M. P., Rodgers, John, and Thompson, J. B., Jr., 1952, Geology of the Appalachian highlands of east-central New York, southern Vermont, and southern New Hampshire, in *Geol. Soc. America Guidebook for field trips in New England*: p. 1-71.
 Hitchcock, C. H., 1861, *Geology of the wild lands [Maine]*: Maine Board Agriculture, 6th Ann. Rept., p. 377-442.
 Neuman, R. B., 1960, Pre-Silurian stratigraphy in the Shin Pond and Stacyville quadrangles, Maine, in *U. S. Geological Survey, Short papers in the Geological Sciences*: U. S. Geol. Survey Prof. Paper 400-B, p. B166-B168.

- Rankin, D. W., 1960, Paleogeographic implications of deposits of hot ash flows: Internat. Geol. Cong., 21st, Copenhagen 1960, Rept., pt. 12, p. 19-34.
- Ruedemann, Rudolf, 1942a, *Oldhamia* and the Rensselaer grit problem: New York State Mus. Bul. 327, p. 5-18.
- 1942b, Cambrian and Ordovician fossils: New York State Mus. Bull. 327, p. 19-32.
- Ruedemann, Rudolf, and Smith, E. S. C., 1935, The Ordovician in Maine: Am. Jour. Sci., 5th ser., v. 30, p. 353-355.
- Rusconi, Carlos, 1956, *Oldhamias* Ordovícicas de Mendoza: Mus. Historia Nat. Mendoza Rev., v. 9, p. 47-53.
- Smith, E. S. C., 1928, The Cambrian in northern Maine: Am. Jour. Sci., 5th ser., v. 15, p. 484-486.
- Walcott, C. D., 1894, Discovery of the genus *Oldhamia* in America: U. S. Natl. Mus. Proc., v. 17, p. 313-315.
- Wilmarth, M. G., 1938, Lexicon of geologic names of the United States: U. S. Geol. Survey Bull. 896, 2396 p.
- Winslow, Arthur, 1894, Lead and zinc in Missouri: Missouri Geol. Survey, v. 6 and 7, 763 p.