Notes on the Geology of Jackson County, Iowa

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NOTES ON THE GEOLOGY OF JACKSON COUNTY, IOWA

H. S. LADD

MAQUOKETA SHALE

Distribution.

Outcrops of the Maquoketa shale are limited to the eastern portions of Jackson county. Their position is controlled chiefly by the gentle regional dip to the southwest which in the north brings the basal beds and the underlying Galena formation to the surface and to the south in Clinton county causes the uppermost Maquoketa beds to disappear under the Silurian. This dip also allows the Maquoketa outcrops to extend progressively farther upstream in the beds of the northern east-flowing creeks.

Aside from this irregular north-south belt along the Mississippi river, the only outcrop of Maquoketa shale in the county is a single inlier. This inlier spreads over portions of Fairfield and Van Buren townships in Jackson county and extends into Clinton county where it is limited to old Goose Lake channel and the valley of the present Sugar creek. On the published maps accompanying the Iowa Geological Survey reports on Jackson and Clinton counties an obvious error appears in the mapping. The Jackson county map shows about four miles of Maquoketa shale along the Clinton county line at the southern border of Fairfield and Van Buren townships while the map of Clinton county shows no Maquoketa shale at all in the adjoining area. The mistake was practically unavoidable and is easily explained. The Maquoketa shale does not outcrop in Clinton county in this area though it does extend beneath the alluvium on the floor of old Goose Lake channel and the present Sugar creek. Udden, mapping Clinton county in 1905, naturally did not suspect this; while Savage, who mapped Jackson county in the following year, found numerous exposures of Maquoketa in the area immediately north. Savage, however, seems to have mapped too much Maquoketa along the border. On one side Silurian outcrops are found immediately west of the railroad in the south-central portion of Sec. 35, Fairfield township; the Maquoketa, therefore, does not extend to the middle of Sec. 34 as mapped. On the east about one quarter

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mile too much Maquoketa is mapped. This is shown by the Silurian outcrops in the south-central part of Sec. 32 of Van Buren township. It is impossible to state just how far the Maquoketa extends into Clinton county as all outcrops were covered by later deposits laid down by Mississippi river and its tributaries when that stream was forced westward by the advancing Illinoian ice sheet.

Stratigraphy.

The Maquoketa, as exposed in Jackson county, is composed chiefly of bluish-green clay and shale and reaches a maximum thickness of 190 feet.

Savage, in his report upon the geology of the county, states, "In Jackson county all the deposits corresponding with the Middle and Lower Maquoketa divisions . . . are entirely wanting. The Maquoketa beds of our area . . . are argillaceous throughout, with the exception of the calcareous, fossil-bearing bands and the transition beds in the upper part. There is present here only the Upper Maquoketa phase." 1

The writer believes that he has proved conclusively that the Lower Maquoketa beds are present in addition to the Upper, though there seems to be little evidence to support a three-fold division. This proof lies in the discovery of the "depauperate zone" and certain other typically fossiliferous basal beds at and near the contact of the Maquoketa with the underlying Galena formation at several widely separated localities.

Faunal Horizons.

There are three well-marked faunal horizons in the Maquoketa. The first of these is the "Ctenodonta" zone, containing the depauperate fauna, found at the base of the formation in the few inches immediately above the uppermost beds of the Galena formation. This zone varies considerably in lithologic characteristics. Where unweathered, the thin black shaly layers contain much pyrite and are highly phosphatic. This zone is well exposed at a number of places from Bellevue on the south to the northern boundary of the county. The layers are crowded with extremely minute forms so that a handful of the material contains literally thousands of fossils. The fauna is chiefly molluscan though all of the other important groups of invertebrates are represented. Certain species of Ctenodonta are especially characteristic. To date, a total of about fifty species have been found.

1 Savage, T. E., Geol. of Jackson County, Iowa Geol. Surv. vol. XVI, p. 598. 1906.
The second, or Graptolite zone, is found within the blue-green shales between twenty and thirty feet above the base of the formation. This zone is also well exposed at several places. Fragmentary graptolite films are abundant on the bedding planes of the shales but other fossils are few and poorly preserved.

The third, or Cornulites zone, is found in the upper twelve feet of the Maquoketa and consists of thin alternating beds of limestone and shale. The fossils occur in both types of rock but are most abundant in the indurated beds. In many places the Maquoketa was eroded prior to the deposition of the Silurian and the Cornulites zone is absent. Elsewhere limestone slabs covered with Plectambonites and other forms are plentiful. The fauna is dominated by the molluscoids, both brachiopods and bryozoans being present in great variety and abundance.

The So-Called Devonian Outlier

General Statement.

In section 18 of Brandon township, in the road one-half mile north of Canton, a number of beds of sandstone and shale outcrop. Associated with these are boulders and weathered materials of Devonian age. Several of the earlier workers, among them, Norton and Savage, visited the locality. The former, finding the rocks favorably exposed, interpreted them as Devonian; while Savage, finding nothing but barren sandstone and shale (except for fragmentary plant remains), thought that they probably were Pennsylvanian in age, though he also gave a careful statement of Norton’s interpretation. Due to recent road work the rocks were again favorably exposed at the time of the writer’s visit. Devonian fossils and limestone blocks were present in some abundance; a careful study, however, convinced him that they bore no relation to the sandstones and shales but apparently were brought by the glacier along with other types of foreign rock found in the same locality.

Description.

The sandstone and shale beds outcrop along the north-south road about one-half mile north of Canton. The sandstone is brown, reddish, or white in color and is coarse-grained, identical in these and other lithologic characters with the sandstone of any one of the Pennsylvanian outliers scattered over the adjoining country.

The soft shale or clay beds are gray or slightly purplish in color, and in general resemble the shales of Pennsylvanian age.
in the nearby outliers. They differ slightly in color and perhaps the bedding is less well defined, but such differences may be due to local causes. The shales are interbedded with the sandstones.

The outlier is a small one,—its total thickness is not over 17 feet. Its horizontal extent is not much greater. Fifteen paces west of the road the Silurian rocks outcrop at a number of places.

On the east a few scattered sandstone boulders show that the outlier extends beyond the road but Silurian rocks are in place at no great distance in a small valley to the southeast. The actual outcrops are limited, therefore, to the wagon road,—rocks appear in the small gullies on the sides of the road as follows. On the east side of the road all the rock exposed is sandstone except for one small exposure of purplish clay. The outcrop extends continuously for a distance of forty paces, the clay bed coming in nine paces above the lowermost (south) outcrop. Savage found plant remains and ripple marks in the sandstone. There is no green clay in place; the writer found no Devonian blocks nor foreign boulders of any kind. As far as the east outcrop is concerned it appears to be identical with the Pennsylvanian outliers of Jackson county.

A sample of the purplish clay was washed and sieved and the residue examined under a binocular microscope. Rounded and frosted white sand grains were abundant but no identifiable fossils were found.

On the west side of the road the rocks outcrop for a distance of 24 paces. Just above the lowermost outcropping bed of sandstone is found a weathered surface bearing chunks of bluish-green clay in which fragments of silicified fossils are numerous. The commonest are the umbonal fragments of *Cyrtina umbonata* (?) Hall, and of a *Spirifer*. Simple and colonial corals were also present in some abundance. None of the green clay was observed in place at this point. Above this weathered fossil-bearing bank of clay was found a second outcrop of the same brown sandstone and above this a number of boulders bearing unsilicified fossils of *Heliophyllum* sp., *Atypa reticularis* Linn., *A. reticularis* var. *independens* Webs., *A. aspera* var. *occidentalis* Hall, etc. These fossils are typical of the Upper Davenport limestone. In the bank where these boulders were found the matrix seems to be green arenaceous clay. This is unquestionably a secondary deposit. The pockets of clay below were not arenaceous. The sand in the arenaceous clay probably came from the sandstone which outcrops at a considerably higher elevation on the east side of the road. Just above the limestone boulders in the same little gully on the west side of the road and still within the sandstone belt,
are found boulders of igneous rock up to eight inches in diameter.

Between the two sandstone outcrops on the west side of the road is a low flat area covered with a film of soft mud. Digging revealed green clay which may be in place at this point. A few boulders of breccia were found just west of the gully on the west side of the road. These appeared to be the ones said by Norton to be “. . . indistinguishable from the lower portions of the Fayette breccia of the Devonian.”

In summary the following points should be emphasized:

1. The only beds actually observed in place were the sandstones and shales which are practically identical with nearby rocks of undoubted Pennsylvanian age.

2. The limestone, breccia, and green clay, which surely are Devonian in age, appear only on one side of the road and are not clearly related to the sandstones and shales, as no fossils were found in the latter beds.

3. In spite of the fact that the locality is situated in the border zone of the Driftless Area large boulders have been brought by the glaciers and such boulders have been found associated with those of the Devonian. Devonian boulders could have been obtained by the Kansan glacier from numerous outcrops to the northwest.

4. Savage calls attention to the fact that the Devonian corals and other fossils found by Norton “. . . do not normally occur associated with such beds of sandstone and shale.”

5. Perhaps the boulders of Devonian limestone are larger than the drift boulders of igneous rock because the former have been transported but a relatively short distance. To be sure they show no evidence of such transportation, but only a small percentage of local glacial boulders do this.

It seems to the writer that the facts are to be explained by the suggestion which Norton put forth but thought unworthy of serious consideration; namely, by “. . . a fortuitous mingling of Devonian drift from the northwestern outcrops with the sandstone and shale of a Carboniferous outlier”; and of themselves it seems that these facts do not prove that the Devonian sea spread as far eastward as the western border of Jackson county.

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