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Note on the Differences between *Acervularia profunda* Hall, and *Acervularia davidsoni* Edwards and Haine

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it is about 50 cents. And improved methods have just been announced by which it may be extracted at a cost of less than 20 cents per pound.

A few months ago a plant was established at Hampton, Iowa, which is working a clay yielding three ounces more of aluminum to the bushel than in any other known locality in the west, and, perhaps, in the United States. The suggestion is important. Iowa has within her borders inexhaustible supplies of good clays admirably adapted for this purpose. But they require careful investigation that they may not be worked indiscriminately and thereby lead to complete failure in many cases. When the industry shall have become thoroughly established the gold fields of California, of Australia, of indeed the whole world will sink into insignificance as compared with the wealth coming from this source.

ON A QUATERNARY SECTION EIGHT MILES SOUTH-EAST OF DES MOINES, IOWA.

BY CHARLES R. KEYES AND R. ELLSWORTH CALL.

The section is located on the line of the Wabash railway about two miles below the little station of Hastie. It forms a continuous exposure of nearly three-fourths of a mile in length; and in some places has almost a vertical face of from 125 to 150 feet. It is capped by twenty feet of loess, carrying characteristic fossils such as *Succinea avara* Say; *Succinea obliqua* Say; *Helicina occulta* Say; *Pupa muscorum* Linne; *Vallonia pulchella* Muller; *Zonites arboreus*, Say; *Patula strigosa*, Gould; and a large *Helix*, probably *Mesodon thyroides*, Say. Below the loess to the track level the section is made up of blue clays and straticulate sands and gravels with occasional large boulders. In the gravel several large fragments of carboniferous limestone with fossils were found. The lower sands rest directly upon the coal measure shales probably since these are well shown in the river bed 10 feet below the track.

The section is of special interest, inasmuch as it is near the terminal moraine of the Des Moines lobe of the great glacier usually referred to the second epoch of the North American Ice Age.

NOTE ON THE DIFFERENCES BETWEEN *ACERVULARIA PROFUNDA* HALL, AND *ACERVULARIA DAVIDSONI* EDWARDS AND HAINE.

BY S. CALVIN.

The original description of *Acervularia profunda* Hall, is found in Hall's Report on the Geological Survey of Iowa, published in 1858. The specimens on which the species was founded came from near Independence, in Buchanan county,

Iowa. In the same report Professor Hall, not without some hesitation identifies another form found abundantly throughout the Devonian area in Iowa, with *Acerularia davidsoni* Edwards and Haine. This, so far as I have been able to ascertain, was the first time the name had been employed in a work published in America; for although Edwards and Haine's specimens came from near Jeffersonville, Indiana, the description of *Acerularia davidsoni* appeared in the great Monograph of the authors, published in France. It should be noted that near Jeffersonville, Indiana, there occurs another form which authors, following the example of Edwards and Haines, usually refer to *Cyathophyllum rugosum* Hall.

The three species mentioned above, as recognized by everyone who has ever handled them, are somewhat closely related. Dr. Rominger in Geology of Michigan, Vol. III, page 107, is disposed to regard them all as but varieties of one species. The *Acerularia davidsoni*, as it occurs in Iowa, is certainly very sharply defined from either of the other two, while *A. profunda* exhibits a very intimate correspondence as to structure with *Cyathophyllum rugosum* from the Falls of the Ohio.

Comparing *A. profunda* with *A. davidsoni* we may note that it differs in the appearance and mode of growth of the corallum, in the greater tendency to independent growth of corallites, in the size of its corallites, the shape of its calyx, the thicker non-corrugated wall by which the individual corallites are bounded, the almost entire absence of an inner pseudo-wall bounding a central area, and the thinner septa with more numerous and conspicuously developed carinæ.

The *A. profunda* is a much coarser looking species than *A. davidsoni*. Its lower surface is never as smooth and flat as is that of most coralla of the other species from Iowa. This surface is transversed radially by the outer corallites which stand out in strong, transversely wrinkled ridges, sometimes almost entirely free from union with contiguous corallites. All the corallites show a remarkable tendency to independent growth, so that in some specimens a large proportion of the whole number of corallites stand apart from those adjacent on the upper surface of its corallum and are individually covered externally with an independent epitheca. In certain modes of preservation the corallites are even separable into wrinkled, polygonal prisms that exactly imitate a very common condition in *Cyathophyllum rugosum*.

In the region from which Hall's type comes the corallites of *A. profunda* are on the average somewhat larger than those of *A. davidsoni*. It is true that the corallites of both species vary within very wide limits, and it is therefore quite possible that the superiority in size of *A. profunda* may not be maintained in all localities. In the Paleontology of Ohio, Vol. II, page 240, Dr. Nicholson describes a form under the name of *Acerularia profunda*, Hall, that is distinguished among other things by having the corallites smaller than *A. davidsoni*.

The shape of the calyx is markedly different in average specimens of the two species. In *A. profunda* the calyces are separated by relatively thin partitions owing to the manner in which the sides of the cup slope abruptly downward and inward from the margin; the septa are thin and have conspicuous, crowded carinæ which are as fully developed near the margin of the calyx as around the central area, particularly in respect to which they are in marked contrast with the septa of *A. davidsoni*. The septa differ still further from those of *A. davidsoni* in having more of their edges free and in having their edges beautifully denticulated. There is but little thickening of the septa to form a pseudo-wall around a central area; indeed this feature is in a large proportion of cases wholly wanting. The secondary septa are nearly as long as the primaries inside the central area.

Acervularia davidsoni, Ed. and H., has a much wider geographical range in Iowa than *A. profunda*, Hall. The area in which *A. profunda* occurs is nearly all included in part of Buchanan and Black Hawk counties, while the area over which the other species is distributed is many times greater. As pointed out in the *American Geologist* for September, 1891, *A. profunda* is not associated in the same beds with *A. davidsoni*, but occurs uniformly at a horizon a few feet lower. Outside the area occupied by *A. profunda* its place seems to have been taken by *Phillipsastræa gigas* Owen. At least this last species, while never very common, occupies the same relative position a few feet below the horizon at which *A. davidsoni* is found, and so far as known it is not present in the region in which *A. profunda* attains its maximum development.

With respect to the particulars in which *A. profunda* differs from *A. davidsoni* it agrees essentially in structure with *Cyathophyllum rugosum* of authors, and it may therefore be regarded as the western representative of the last named species. If carinated septa have any generic significance, then *Cyathophyllum rugosum* is not a *Cyathophyllum* at all. Whatever the decision may be *C. rugosum* and *A. profunda* must ultimately stand side by side in the same genus.

A. davidsoni stands somewhat apart from both of the foregoing species in a number of particulars. The calyces have a sharply defined central pit with explanate margins. In typical specimens the floor of the calyx, except in the central pit, is almost on a level with the margin; the septa are thick, scarcely denticulated, with but a small portion of their edges free, the carinæ are few and clumsy and chiefly developed in the region immediately surrounding the central area. Both primary and secondary septa are conspicuously thickened around the edge of the central area, the carinæ are also developed there better than elsewhere, the effect being to produce in polished sections the appearance of a bi-areal coral with a central area bounded by a definite inner wall. Under the magnifier this wall is never complete. The thickened septa and strongly developed carinæ never quite coalesce, so that the outer area is never, as in true bi-areal corals, perfectly shut off from the central space. At the margin of this central space the secondary septa all end more or less abruptly, and only the primary septa are continued as thin non-carinated lamellæ into the central area.

Acervularia davidsoni is certainly congeneric with some of the species referred to *Acervularia* by Edwards and Haime and other authors. Whether or not it is generically related to the type species of the genus may be left an open question. So long as genera are mere artificial creations without sharply defined natural boundaries it will do no violence to the facts, but will be a matter of convenience and at the same time will give effect to a recognizable structural difference, if we keep *A. davidsoni* apart from the typical forms of the genus *Cyathophyllum*,* and for the present at least retain it in the genus *Acervularia*. Along with *A. davidsoni* must go *Acervularia inequalis*, Hall and Whitfield. As a mere matter of convenience, but with less confidence as to the justness of the arrangement, we may for the present add to the recognized species of *Acervularia* the *A. profunda*, Hall, and the *Cyathophyllum rugosum* of authors. The last two species may yet, with perfect justice, be separated generically from *A. davidsoni*.

*Dr. Rominger and Mr. W. J. Davis place this and related species under the genus *Cyathophyllum*. See *Geology of Michigan*, Vol. III., and *Kentucky Fossil Corals*.