

CORRELATION OF THE DEVONIAN SYSTEM OF THE ROCK ISLAND REGION.

W. ELMER EKBLAW.

This paper is an attempt to correlate the strata of the Devonian system of the northwest part of Illinois with those of the same system in other parts of the State and in adjacent States. It is the result of detailed field work done in that region in the summer of 1910, under the direction of Professor T. E. Savage, and in accordance with a general plan for the study of different formations of the State as formulated by Mr. F. W. DeWolf, director of the State Geological Survey.

Not much work has been done on the Devonian of this region. A. H. Worthen,¹ F. B. Meek,² James Shaw³ and J. A. Udden⁴ have devoted some attention to it, but no detailed account of its paleontology and stratigraphy has yet been given.

The Devonian exposures in northwest Illinois are confined to a rather narrow belt in Rock Island and Henry counties, bordering the bluffs of the Mississippi and Rock Rivers, and extending from a point opposite Montpelier, Iowa, to Green River, tributary to Rock River, and to Campbell's Island on the Mississippi River.

This narrow belt embraces the margin of the highlands fronting upon the flood plains of the Rock and Mississippi Rivers, and that portion of the flood plains immediately adjacent to the bluffs

¹ Since the presentation of the foregoing paper the well No. 27 at Cedar Point has been completed, so that the section at that place has been extended by the addition of 110 feet of Galena-Trenton limestone and 140 feet of St. Peter sandstone to the top of the Lower Magnesian limestone. The total depth is now 1,749 feet and 8 inches. These data have been included in the diagram on Plate II.

² Worthen, A. H., *Geol. Survey of Illinois*, Vol. I, 1866, pp. 120-122.

³ Worthen, A. H., and Meek, F. B., *Geol. Survey Illinois*, Vol. II, 1866, p. 423.

⁴ Idem, Vol. III, 1868, pp. 419-449.

⁵ Worthen, A. H., and Shaw, James, *Geol. Survey Illinois*, Vol. V, 1873, pp. 217-

234.

⁶ Udden, J. A., *Rept. Illinois Board of World's Fair Commissioners*, 1893, pp. 117-177.

⁷ Idem, *Jour. Cincinnati Soc. Nat. Hist.*, Vol. XIX, 1896, pp. 93-94.

of the highlands. The bluffs rise boldly from eighty to 100 feet above the river flats. They are much dissected by small streams, which have cut through the drift of the Pleistocene, and, wherever the Pennsylvanian is present, through the shales and sandstones of that system, exposing the Devonian limestones below.

These small streams have comparatively steep gradients and a consequent erosive power of considerable strength. Wherever they cut through the limestones, they have developed rather narrow valleys with steep banks. The larger of these creeks are Fancy Creek, Case Creek and Mill Creek, all affording good exposures of Devonian strata in their banks.

The drift of the Pleistocene varies much in thickness, in some places scarcely covering the country rock, while on some of the hills, well borings reveal a depth of fifty feet of glacial material, which is probably all of Illinoian age. In the river valleys, material from the Wisconsin drift to the eastward has been deposited, and in the eastern portion of the area scattered localities of ridged loess and sand occur, which resemble in character those of the Iowan drift border. Usually the Pleistocene deposits rest upon those of the Pennsylvanian, but when the latter have been eroded the loess and drift cover the limestones of the Devonian age.

The Pennsylvanian shales and sandstones of this area, some seventy to 100 feet in thickness, belong to the Pottsville and Carbondale stages. They overlie the Devonian limestones, which at the time of deposition of the Pennsylvanian rocks formed the well dissected surface of the area. Well defined erosion valleys in the Devonian are filled with horizontally bedded shales, sandstones and occasional thin seams of coal. In a few separated areas these coal seams are thick enough for profitable working. The extent of the unconformity between the Pennsylvanian beds and the Devonian strata is revealed by the absence of the Upper Devonian, the entire Mississippian, and the lower portion of the Pottsville.

The absence of these strata may be due to the fact that the missing members were never deposited in this area, in consequence of land conditions prevailing here during their deposition elsewhere, but it is possible that at least a part of these members were laid down, and afterward eroded before the deposition of the overlying Pennsylvanian. The evidence which the very rough and broken Devonian surface affords tends to confirm this latter view.

The Devonian system of this area, the correlation of which is

the purpose of the present study, consists of limestones of Hamilton age, varying in thickness in the different exposures, from a few feet in the southwest corner of the area to over 100 feet in the Cady quarries of East Moline. They rest unconformably upon the Niagaran strata of the Silurian system, the unconformity in this case being more probably due to the prevalence of land conditions here, while the intervening members of the Silurian and Devonian system were being deposited in other localities.

The Silurian limestones upon which the Devonian beds rest unconformably belong to the Lockport stage of the Niagaran. They vary greatly in thickness, the maximum in this region being reported by Udden¹ as 364 feet. Their yellow color, dolomitic character and the presence of fragments of *Pentamerus oblongus* distinguish them from those of the Devonian. In this immediate area they are not exposed, their nearest outcrop occurring some miles farther north, near Port Byron.

The most westerly exposure of the Devonian limestone in this region is in the low bank of the Mississippi River directly across the river from Montpelier, Iowa. From this exposure eastward as far as the Green River, in Henry county, and northeastward to Campbell's Island in the Mississippi, the Hamilton limestone outcrops at many points in the banks and beds of the streams. The best exposures occur along Fancy Creek, Mill Creek and Case Creek. Other important exposures are those near the Water Power Company's dam, between Milan and Rock Island.

The Hamilton limestone is composed of several very definite members, readily distinguished by their fossils, or by their lithological characters. The lowest members are notably unfossiliferous, while some of the upper members are made up almost entirely of brachiopod shells, crinoid stems, or corals. The texture, jointing, and color of the various members also vary to such an extent that the different horizons can often be recognized by their lithological characters alone.

DETAILED SECTIONS OF THE DEVONIAN STRATA.

A continuous section from the lowest strata of the Devonian system exposed in the county, in the Cady quarry in East Moline, to the topmost stratum underlying the Pennsylvanian shales and sandstones along Fancy Creek, may be obtained by connecting up

¹ Udden, J. A., Rept. Illinois Board World's Fair Commissioners, 1893, p. 140.

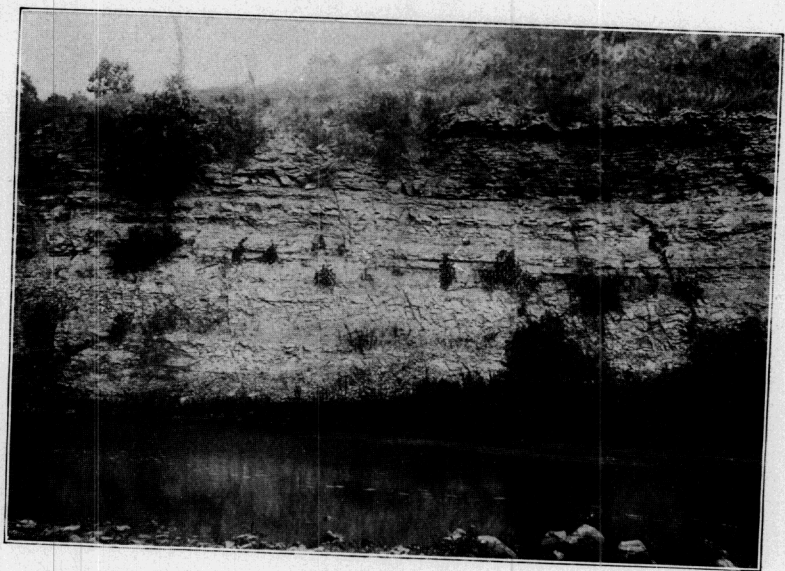


Figure 1. View of that portion of the Cedar Valley limestone immediately below the *Acerularia davidsoni* Coral reef, which is the overhanging ledge at the top of this exposure along Mill Creek, Rock Island county, Illinois. The characteristic oblique jointing of some of the beds is quite distinct.



Figure 2. View of an outcrop of the lower portion of the Cedar Valley limestone along Mill Creek, Rock Island county, Illinois; the lowest block in the right-hand corner is the top of the *Phillipsastrea ozne*, which marks the uppermost layer of the Wapsipinicon stage.

the exposures in the Cady quarry, the outcrops along Mill Creek and the outcrops along Fancy Creek. Such a continuous section aggregates a thickness of more than 150 feet.

In the face of the Cady quarry 100 feet of brecciated, non-fossiliferous limestone is revealed, representing the lower portion of the Devonian section in this area. This exposure, which is accessible to careful examination and study, is described in the following section, designated N_2 :

SECTION OF ROCKS EXPOSED IN THE CADY QUARRY.		Feet. In.
N_{2n} .	Loess and drift.....	10
N_{2m} .	Gray to yellow, soft fissile shale.....	2
N_{2l} .	Dark, carbonaceous shale.....	8
N_{2k} .	Very hard, brown to red, ironstained limestone, containing many coralla of <i>Phillipsastrea billingsi</i> and shells of <i>Atrypa reticularis</i>	3
N_{2j} .	Light gray to brown, much brecciated limestone, in layers 2 inches to 3 feet thick.....	30
N_{2i} .	Gray, brecciated, very irregularly jointed limestone, in imperfect layers 4 inches to 3 feet thick, with occasional chert nodules	15
N_{2h} .	Hard, gray, fine-grained, brecciated limestone, in layers 2 inches to 3 feet thick, with conspicuous vertical joints, and occasional ribbon-like veins of calcite.....	30
N_{2g} .	Narrow band of hard, chocolate-colored, very fine-grained limestone, with crevices along joints and bedding planes filled with calcite.....	6
N_{2f} .	Hard, dark gray, fine-grained limestone, with crystals of calcite common along the joints.....	3
N_{2e} .	Band of hard, almost black, coarse-grained limestone.....	1
N_{2d} .	Soft, yellow, coarse-grained limestone, containing a distinct band of chert nodules near the middle.....	2
N_{2c} .	Soft, blue, sandy to shale limestone, containing much calcite.....	6
N_{2b} .	Band of soft, dark gray to dark brown, fine-grained limestone, in layers 2 to 4 inches thick, and containing many calcite crystals	1
N_{2a} .	Very hard, grayish brown, fine-grained brecciated limestone, in layers 4 inches to 3 feet thick. Lamination planes conspicuous in the lower portion. To the bottom.....	15

In the foregoing section the shale members (N_{2l} and N_{2m}) represent the Pennsylvanian system, while the limestone members (N_{2a} to N_{2k} , inclusive), almost 100 feet in vertical thickness, belong to the Devonian. Of the Devonian members exposed in the quarry face, only the upper ten or fifteen feet may be seen anywhere else in Rock Island county. These lower 100 feet of Devonian strata are almost barren of fossils. Their correlation with the Devonian rocks in other regions must be made on the basis of their lithological character as revealed in this one exposure. The most distinctive of these characters is the brecciation which continues almost without interruption from the base to the top of the barren lower layers.

From this exposure in the Cady quarry the section may be continued upward in the Mill Creek outcrops, of which the lowest member, E_{1a}, corresponds to the upper portion of the member N_{2j}; and members E_{1b} and E_{1c} to the member N_{2k}.

The sections along Mill Creek comprise some of the most typical exposures of the Devonian rocks found in Rock Island county. With the exception of the section obtained in the Cady quarries, the Mill Creek sections, taken in their entirety, show the greatest thickness of Devonian strata, and, without exception, yield the greatest number of fossils.

The sections begin near the confluence of Mill Creek and Rock River, where the Fayette breccia appears, and extend continuously to the center of Sec. 25, T. 17 N., R. 2 W. A total vertical thickness of more than sixty feet of limestone is exposed in this section. A number of outcrops occur farther up the stream, but the strata exposed are included within the continuous section farther down the stream. The Mill Creek section marked E₁ is as follows:

SECTION OF STRATA EXPOSED ALONG MILL CREEK.		Feet. In.
E _{1p} .	Layer of gray, shelly, somewhat crystallized limestone, containing a large number of small shells of <i>Atrypa reticularis</i>	1 3
	<i>Zaphrentis</i> sp.	Schizophoria striatula
	<i>Zaphrentis gigantea</i>	Reticularia fimbriata
	<i>Athyris fultonensis</i>	Spirifer iowensis
	<i>Atrypa reticularis</i>	Spirifer subvaricosus
E _{1o} .	Coral limestone; <i>Acervularia davidsoni</i> coral reef.....	2 6
E _{1n} .	Brown limestone extending up to the top of the <i>Acervularia</i> coral reef	4
	<i>Striatopora rugosa</i>	Atrypa reticularis
	<i>Cyclotrypa communis</i>	Chonetes scitulus
	<i>Cystodictya hamiltonensis</i>	Cranæna iowensis
	<i>Euspilopora barrisi</i>	Cyrtina umbonata
	<i>Fenestella vera</i>	Pentamerella dubia
	<i>Fistulipora monticulata</i>	Spirifer subvaricosus
	<i>Hemitrypa tenera</i>	Spirifer euryteines
	<i>Orbignyella tenera</i>	Spirifer iowensis
	<i>Reteporina hamiltonensis</i>	Stropheodonta demissa
	<i>Semicoscium rhombicum</i>	Stropheodonta perplana
	<i>Platyceras</i> sp.	
E _{1m} .	Brown, fine-grained somewhat crystalline and crinoidal limestone, weathering into slabs 2 to 3 inches thick, and yielding the following fossils.....	5
	<i>Eridotrypa appressa</i>	Schuchertella chemungensis
	<i>Atrypa reticularis</i>	Spirifer euryteines
	<i>Cranæna iowensis</i>	Spirifer iowensis
	<i>Gypidula comis</i>	Spirifer subvaricosus
	<i>Reticularia fimbriata</i>	Stropheodonta demissa
	<i>Schizophoria striatula</i>	Stropheodonta perplana
	<i>Phacops rana</i>	

E.l.	Soft, yellowish, fine-grained impure limestone, very shaly and shelly, weathering into thin bands. Pelecypods are particularly numerous in this member.....	Feet. In.	4 6
	<i>Cyclotrypa collina</i>	<i>Stropheodonta perplana</i>	
	<i>Cyclotrypa communis</i>	<i>Platyceras dumosus</i>	
	<i>Fistulipora monticulata</i>	<i>Actinopteria decussata</i>	
	<i>Orbignyella monticula</i>	<i>Cypricardella bellistriata</i>	
	<i>Atrypa reticularis</i>	<i>Goniophora</i> sp.	
	<i>Chonetes scitulus</i>	<i>Modiola</i> sp.	
	<i>Cyrtina umbonata</i>	<i>Modiomorpha concentrica</i>	
	<i>Pholidostrophia iowensis</i>	<i>Mytilops praecedens</i>	
	<i>Spirifer asper</i>	<i>Mytilarca</i> sp.	
	<i>Spirifer euryteines</i>	<i>Paleoneilo</i> cf. <i>plana</i>	
	<i>Spirifer iowensis</i>	<i>Paracyclas elliptica</i>	
	<i>Spirifer subvaricosus</i>	<i>Ptychopteria</i> sp.	
	<i>Stropheodonta demissa</i>	<i>Sphenotus</i> sp.	
E.k.	Soft, yellowish, impure and shaly limestone. Joint planes nearly vertical and close together. Stratification is thin, the rock weathers readily.....		5
	<i>Cyathophyllum</i> sp.	<i>Chonetes scitulus</i>	
	<i>Striatopora rugosa</i>	<i>Cranæna iowensis</i>	
	<i>Spirorbis angulatus</i>	<i>Pholidostrophia iowensis</i>	
	<i>Cyclotrypa collina</i>	<i>Roemerella grandis</i>	
	<i>Cyclotrypa communis</i>	<i>Schizophoria striatula</i>	
	<i>Cystodictya hamiltonensis</i>	<i>Spirifer asper</i>	
	<i>Eridophyllum appressa</i>	<i>Spirifer bimesialis</i>	
	<i>Euspilopora barrisi</i>	<i>Spirifer euryteines</i>	
	<i>Fenestella vera</i>	<i>Spirifer iowensis</i>	
	<i>Fistulipora monticulata</i>	<i>Spirifer subvaricosus</i>	
	<i>Orbignyella monticula</i>	<i>Cypricardina indenta</i>	
	<i>Semicoscinium rhombicum</i>	<i>Paleoneilo</i> cf. <i>plana</i>	
	<i>Atrypa reticularis</i>	<i>Gomphoceras ajax</i>	
		<i>Phacops rana</i>	
E.j.	Dark-gray to yellowish-gray, rather impure limestone, weathering rather easily. Jointing characteristically oblique....		4
	<i>Ceratopora</i> sp.	<i>Atrypa spinosa</i>	
	<i>Cystiphyllum</i> sp.	<i>Chonetes scitulus</i>	
	<i>Streptelasma rectum</i>	<i>Cranæna iowensis</i>	
	<i>Spirorbis angulatus</i>	<i>Cranaena romingeri</i>	
	<i>Cyclotrypa collina</i>	<i>Crania sheldoni</i>	
	<i>Cyclotrypa communis</i>	<i>Cyrtina hamiltonensis</i> , var. <i>recta</i>	
	<i>Eridotrypa appressa</i>	<i>Cyrtina umbonata</i>	
	<i>Fistulipora monticulata</i>	<i>Pentamerella dubia</i>	
	<i>Hederella filiformis</i>	<i>Pholidostrophia iowensis</i>	
	<i>Orbignyella monticula</i>	<i>Schizophoria striatula</i>	
	<i>Petalotrypa compressa</i>	<i>Spirifer asper</i>	
	<i>Rhombopora sulcifera</i>	<i>Spirifer euryteines</i>	
	<i>Semicoscinium rhombicum</i>	<i>Spirifer iowensis</i>	
	<i>Ambocoelia umbonata</i>	<i>Spirifer subvaricosus</i>	
	<i>Atrypa hystrix</i>	<i>Stropheodonta demissa</i>	
	<i>Atrypa reticularia</i>	<i>Stropheodonta perplana</i>	
E.i.	Rather soft, gray to yellowish, impure limestone, in rather thick layers which weather easily and show oblique jointing.....		5
	<i>Streptelasma rectum</i>	<i>Cranæna iowensis</i>	
	<i>Cyclotrypa communis</i>	<i>Crania sheldoni</i>	
	<i>Cystodictya hamiltonensis</i>	<i>Cyrtina umbonata</i>	
	<i>Cyclotrypa collina</i>	<i>Gypidula comis</i>	
	<i>Fenestella vera</i>	<i>Pentamerella dubia</i>	
	<i>Fistulipora monticulata</i>	<i>Pholidostrophia iowensis</i>	

<i>Hemitrypa tenera</i>	<i>Productella subalata</i>	
<i>Orbignyella monticula</i>	<i>Reticularia fimbriata</i>	
<i>Semicosciniium rhombicum</i>	<i>Schizophoria striatula</i>	
<i>Spirorbis</i> sp.	<i>Spirifer asper</i>	
<i>Athyris fultonensis</i>	<i>Spirifer iowensis</i>	
<i>Atrypa hystrix</i>	<i>Spirifer euryteines</i>	
<i>Atrypa reticularis</i>	<i>Spirifer subvaricosus</i>	
<i>Chonetes scitulus</i>	<i>Stropheodonta demissa</i>	
	<i>Stropheodonta perplana</i>	
E ₁ h. Gray, thinly-bedded, rather impure limestone, weathering easily. Fossils rather numerous.....		2 6
<i>Ceratopora</i> sp.	<i>Crania iowensis</i>	
<i>Streptelasma rectum</i>	<i>Cyrtina umbonata</i>	
<i>Cyclotrypa communis</i>	<i>Pentamerella dubia</i>	
<i>Cystodictya hamiltonensis</i>	<i>Schizophoria striatula</i>	
<i>Eridotrypa appressa</i>	<i>Productella subalata</i>	
<i>Euspilopora barrisi</i>	<i>Reticularia fimbriata</i>	
<i>Fistulipora monticulata</i>	<i>Spirifer asper</i>	
<i>Hemitrypa tenera</i>	<i>Spirifer bimesialis</i>	
<i>Orbignyella monticula</i>	<i>Spirifer euryteines</i>	
<i>Petalotrypa compressa</i>	<i>Spirifer iowensis</i>	
<i>Rhombopora subannulata</i>	<i>Spirifer subvaricosus</i>	
<i>Semicosciniium rhombicum</i>	<i>Stropheodonta demissa</i>	
<i>Atrypa hystrix</i>	<i>Stropheodonta perplana</i>	
<i>Atrypa reticularis</i>	<i>Tentaculites bellulus</i>	
<i>Chonetes scitulus</i>	<i>Phacops rana</i>	
E ₁ g. Gray, fine-grained, easily-eroded, impure limestone, shaly in places. Fossils not numerous but varied.....		2 6
<i>Streptelasma rectum</i>	<i>Chonetes scitulus</i>	
<i>Cyclotrypa communis</i>	<i>Crania sheldoni</i>	
<i>Cystodictya hamiltonensis</i>	<i>Lingulodiscina marginalis</i>	
<i>Fenestella vera</i>	<i>Pholidostrophia iowensis</i>	
<i>Fistulipora monticulata</i>	<i>Productella subalata</i>	
<i>Hemitrypa tenera</i>	<i>Reticularia fimbriata</i>	
<i>Orbignyella monticula</i>	<i>Schizophoria striatula</i>	
<i>Semicosciniium rhombicum</i>	<i>Schuchertella chemungensis</i>	
<i>Athyris fultonensis</i>	<i>Spirifer subvaricosus</i>	
<i>Atrypa hystrix</i>	<i>Spirifer iowensis</i>	
<i>Atrypa reticularis</i>	<i>Stropheodonta demissa</i>	
	<i>Stropheodonta perplana</i>	
E ₁ f. Yellowish, impure, richly fossiliferous limestone.....		
<i>Streptelasma rectum</i>	<i>Chonetes scitulus</i>	
<i>Cyclotrypa communis</i>	<i>Cyrtina umbonata</i>	
<i>Cystodictya hamiltonensis</i>	<i>Schizophoria striatula</i>	
<i>Fenistella vera</i>	<i>Schuchertella chemungensis</i>	
<i>Fenestropora occidentalis</i>	<i>Spirifer iowensis</i>	
<i>Hemitrypa tenera</i>	<i>Spirifer subvaricosus</i>	
<i>Orbignyella monticula</i>	<i>Stropheodonta demissa</i>	
<i>Rhombopora subannulata</i>	<i>Stropheodonta perplana</i>	
<i>Semicosciniium rhombicum</i>	<i>Bellerophon pelops</i>	
<i>Atrypa hystrix</i>	<i>Actinopteria decussata</i>	
<i>Atrypa reticularis</i>	<i>Phacops rana</i>	
E ₁ e. Layer of hard, dark gray limestone.....		1 8
<i>Styloidictyon expansum</i>	<i>Schizophoria striatula</i>	
<i>Atrypa hystrix</i>	<i>Spirifer bimesialis</i>	
<i>Atrypa reticularis</i>	<i>Spirifer euryteines</i>	
<i>Cyrtina hamiltonensis</i>	<i>Spirifer subvaricosus</i>	
<i>Pholidostrophia iowensis</i>	<i>Stropheodonta demissa</i>	

- | | Feet. In. |
|--|---------------------------------|
| E ₁ d. Layer of yellowish, rather shaly limestone which weathers readily. Fossils resembling those of E ₁ e..... | 9 |
| <i>Cyathophyllum</i> sp. | <i>Productella subalata</i> |
| <i>Cystiphyllum</i> cf. <i>americanum</i> | <i>Schizophoria striatula</i> |
| <i>Streptelasma simplex</i> | <i>Spirifer iowensis</i> |
| <i>Atrypa hystrix</i> | <i>Stropheodonta demissa</i> |
| <i>Atrypa reticularis</i> | <i>Stropheodonta perplana</i> |
| <i>Atrypa spinosa</i> | <i>Platyceras dumosum</i> |
| <i>Cranæna iowensis</i> | <i>Pleurotomaria lucina</i> |
| | <i>Gomphoceras ajax</i> |
| E ₁ c. Outcrop under and just south of the Rock Island Ry. bridge, in the S.E. ¼ sec. 24, T. 17 N., R. 1 W. Very hard, fine-grained limestone containing many corals. May be designated as the <i>Phillipsastrea</i> horizon..... | I 3 |
| <i>Astraeospongia hamiltonensis</i> | <i>Zaphrentis</i> sp. |
| <i>Alveolites goldfussi</i> | <i>Hemitrypa tenera</i> |
| <i>Acerularia davidsoni</i> | <i>Orbignyella monticola</i> |
| <i>Acerularia profunda</i> | <i>Atrypa hystrix</i> |
| <i>Ceratopora</i> sp. | <i>Atrypa reticularis</i> |
| <i>Cladopora palmata</i> | <i>Cranæna romingeri</i> |
| <i>Cladopora</i> sp. | <i>Gypidula comis</i> |
| <i>Craspedophyllum archiaci</i> | <i>Nucleospira ventricosa</i> |
| <i>Cyathophyllum</i> sp. | <i>Productella subalata</i> |
| <i>Cystiphyllum americanum</i> | <i>Reticularia subundifera</i> |
| <i>Favosites alpenensis</i> | <i>Schizophoria striatula</i> |
| <i>Favosites hamiltonensis</i> | <i>Spirifer euryteines</i> |
| <i>Favosites placenta</i> | <i>Spirifer iowensis</i> |
| <i>Heliophyllum halli</i> | <i>Stropheodonta demissa</i> |
| <i>Phillipsastrea billingsi</i> | <i>Bellerophon pelops</i> |
| <i>Streptelasma simplex</i> | <i>Pleurotomaria lucina</i> |
| | <i>Gomphoceras</i> sp. |
| E ₁ b. Stratum of hard, gray limestone, just above the breccia, and below <i>Phillipsastrea</i> zone, containing the fossils..... | I 3 |
| <i>Zaphrentis</i> sp. | <i>Pholidostrophia iowensis</i> |
| <i>Athyris fultonensis</i> | <i>Productella subalata</i> |
| <i>Atrypa hystrix</i> | <i>Reticularia fimbriata</i> |
| <i>Atrypa reticularis</i> | <i>Spirifer subvaricosus</i> |
| <i>Cranæna iowensis</i> | <i>Stropheodonta demissa</i> |
| <i>Cyrtina hamiltonensis</i> | <i>Bellerophon pelops</i> |
| <i>Pentamerella dubia</i> | <i>Pleurotomaria lucina</i> |
| | <i>Gomphoceras</i> |
| E ₁ a. Outcrop in bed of Mill Creek, one-half mile east of Milan, north and south of wagon bridge. Dark-gray, fine-grained, much brecciated limestone, bearing no fossils..... | 10 |

The members of the section from the bottom up to the *Acerularia davidsoni* coral reef are clearly separable into two general divisions: the lower, softer and more yellow is thinly stratified; the upper, harder and more brown, is in thicker layers. In both portions the jointing is not nearly so close together and is more nearly perpendicular to the bedding planes than in the members E₁g to E₁j, inclusive. The latter members are distinctly and characteristically obliquely jointed, and shattered and broken into small, very sharp and angular blocks.

The uppermost member of the Mill Creek section, E₁p, may be

readily correlated directly with the member D₈h of the Fancy Creek section, by means of the fossils. A number of intervening exposures substantiate this correlation. The Fancy Creek section is as follows:

	Feet.	In.
D ₈ h. Very hard, iron-stained, fine-grained limestone, containing <i>Stropheodonta concava</i> <i>Stropheodonta perplana</i>	10	
D ₈ g. Iron-stained, fine-grained, slightly crystalline limestone..... <i>Athyris fultonensis</i> <i>Spirifer asper</i> <i>Cranæna iowensis</i> <i>Stropheodonta demissa</i>	1	
D ₈ f. Hard, slightly iron-stained, fine-grained limestone with numerous coralla of <i>Zaphrentis gigantea</i>	2	
D ₈ e. Hard, dark-gray, almost crystalline limestone, slightly stained by iron. Many fossils..... <i>Stylocidictyon expansum</i> <i>Lingulodiscina marginalis</i> <i>Cladopora prolifica</i> <i>Pugnax</i> sp. <i>Zaphrentis</i> sp. <i>Reticularia fimbriata</i> <i>Athyris fultonensis</i> <i>Spirifer iowensis</i> <i>Cranæna</i> sp. <i>Spirifer subvaricosus</i> <i>Bellerophon pelops</i>	1	
D ₈ d. Very hard, banded, black and gray, limestone with numerous stromatoporoids <i>Cladopora palmata</i> <i>Zaphrentis</i> 2 sp. <i>Cladopora prolifica</i> <i>Spirifer iowensis</i> <i>Stropheodonta demissa</i>	4	
D ₈ c. Rather soft, coarse-grained limestone, with many fossils..... <i>Atrypa reticularis</i> <i>Spirifer iowensis</i> <i>Schizophoria striatula</i> <i>Stropheodonta demissa</i> <i>Spirifer euryteines</i> <i>Phacops rana</i>	8	
D ₈ b. Bluish to brownish, irregularly-bedded, fine-grained, limestone with band of large <i>Atrypa reticularis</i> near middle. The fossils are..... <i>Atrypa reticularis</i> <i>Stropheodonta demissa</i> <i>Cranæna iowensis</i> <i>Edmondia</i> sp.	3	6
D ₈ a. Gray, locally iron-stained, shelly and shaly limestone, containing <i>Spirifer iowensis</i> and numerous small <i>Atrypa reticularis</i> throughout. <i>Athyris fultonensis</i> and <i>Spirifer euryteines</i> are common near the top..... <i>Streptelasma rectum</i> <i>Schizophoria striatula</i> <i>Orbignyella monticula</i> <i>Spirifer asper</i> <i>Athyris fultonensis</i> <i>Spirifer euryteines</i> <i>Atrypa reticularis</i> <i>Spirifer subvaricosus</i> <i>Cranæna iowensis</i> <i>Stropheodonta demissa</i> <i>Cyrtina umbonata</i> , var. <i>alta</i> <i>Stropheodonta perplana</i>	3	

From the foregoing sections, which include all of the Devonian strata that are exposed in Rock Island county, a generalized section of the Devonian rocks in this area may be constructed. The lowest members of this generalized section, including all the brecciated beds, are represented in the Cady quarry exposure in East Moline. The uppermost member of the Cady quarry section, the Phillipsastrea zone, N₂k, is equivalent to E₁c of the

Mill Creek section. Consequently the Mill Creek section becomes a direct upward continuation of the Cady quarry section. The uppermost member of the Mill Creek section, E_{1p}, which contains the numerous small shells of *Atrypa reticularis*, is equivalent to the lowest member of the Fancy Creek section D_{8a}, of which the topmost layer, D_{8h}, represents the uppermost rocks of the Devonian system found in Rock Island county.

The aggregate thickness of the Devonian rocks in Rock Island county is thus found to be slightly more than 150 feet, of which the lower 100 feet are exposed only in the Cady quarry at East Moline.

LIST OF FOSSILS.

A list of the fossils collected from the Devonian strata in Rock Island county is given in full below. The names of those which occur in the Devonian of Iowa are indicated by "x" in the first column; those which occur in Jackson and Union counties by an "x" in the second column; those which occur in New York and the eastern province of the Hamilton by an "x" in the third column; those which occur in Wisconsin by an "x" in the fourth column; and those which occur in Jersey and Calhoun counties, Illinois, by an "x" in the fifth column.

The list of fossils occurring in the Devonian strata of Iowa was compiled from the reports of the Iowa Geological Survey, and since these reports are not especially paleontological, the list is probably incomplete; the list of the fossils of Jackson and Union counties, Illinois, from unpublished lists furnished by Professor Savage; the list of the fossils from New York and the Eastern Province of the Hamilton, from State Reports and various other sources; the list of the fossils from Wisconsin, from Cleland's¹ report of 1911; and the list from Jersey and Calhoun counties, from an unpublished thesis by J. G. Hutton.

	I	2	3	4	5
<i>Astraeostongia hamiltonensis</i> , Meek and Worthen.....	*				*
<i>Canopora incrustans</i> , Hall and Whitfield.....	*				
<i>Stromatopora</i> sp.....	*				
<i>Stylodictyon expansum</i> , Hall and Whitfield.....	*				
<i>Acerularia davidsoni</i> , Edwards and Haime.....	*		*	*	*
<i>Acerularia profunda</i> , Hall.....	*				*
<i>Alveolites goldfussi</i> , Billings.....	*		*		*
<i>Amplexus</i> sp.....	*				
<i>Ceratopora</i> sp.....	*				
<i>Cladopora cryptodens</i> , Billings.....	*		*		*
<i>Cladopora prolifica</i> , Hall and Whitfield.....	*				

¹ Cleland, H. F., Wisconsin Geol. and Nat. Hist. Survey Bull., No. XXI, 1911. The fossils and stratigraphy of the middle Devonian of Wisconsin.

	1	2	3	4	5
<i>Cladopora palmata</i> , Hall and Whitfield.....	*				
<i>Craspedophyllum archiaci</i> , Billings.....	*	*	*		
<i>Cyathophyllum</i> sp.....	*	*	*	*	*
<i>Cystiphyllum</i> cf. <i>americanum</i> , Edwards and Haime.....	*			*	*
<i>Favosites alpenensis</i> , Winchell.....	*		*		
<i>Favosites placenta</i> , Rominger.....	*	*	*		
<i>Heliophyllum halli</i> , Edwards and Haime.....	*				
<i>Phillipsastrea billingsi</i> , Calvin.....			*		
<i>Streptelasma rectum</i> , Hall.....			*		
<i>Streptelasma simplex</i> , Hall.....	*				
<i>Striatopora rugosa</i> , Hall.....			*		
<i>Zaphrentis gigantea</i> , Lesueur.....	.				
<i>Zaphrentis</i> sp.....			*		
<i>Spirorbis angulatus</i> , Hall.....	*		*		
<i>Cyclotrypa collina</i> , Ulrich.....	*				
<i>Cyclotrypa communis</i> , Ulrich.....	*		*	*	
<i>Cystodictya hamiltonensis</i> , Ulrich.....	*			*	
<i>Eridotrypa appressa</i> , Ulrich.....	*				
<i>Euspilopora barrisi</i> , Ulrich.....	*			*	
<i>Fenestella vera</i> , Ulrich.....	*				
<i>Fenestrapora occidentalis</i> , Ulrich.....	*				
<i>Fistulipora stricta</i> , Ulrich.....	*			*	
<i>Fistulipora monticulata</i> , Ulrich.....	*			*	
<i>Hederella filiformis</i> , Billings.....	*				
<i>Hemitrypa tenera</i> , Ulrich.....	*		*		
<i>Meekopora stellifera</i> , Rominger.....	*			*	
<i>Orbignyella monticula</i> , White.....				*	
<i>Orbignyella tenera</i> , Cleland.....	*			*	
<i>Petalotrypa compressa</i> , Ulrich.....	*			*	
<i>Reteporina hamiltonensis</i> , Ulrich.....	*				
<i>Rhombopora subannulata</i> , Ulrich.....	*				
<i>Rhombopora sulcifera</i> , Ulrich.....	*			*	
<i>Semicoscinium rhombicum</i> , Ulrich.....		*	*		
<i>Ambocælia umbonata</i> , Conrad.....	*	*	*	*	*
<i>Athyris fultonensis</i> , Swallow.....	*	*	*	*	*
<i>Atrypa hystrix</i> , Hall.....	*				
<i>Atrypa aspera occidentalis</i> , Hall.....	*	*	*	*	*
<i>Atrypa reticularis</i> , Linnæus.....	*	*	*	*	*
<i>Atrypa spinosa</i> , Hall.....	*	*	*		
<i>Chonetes scitulus</i> , Hall.....	*			*	*
<i>Cranæna iowensis</i> Calvin.....	*	*	*		
<i>Cranæna romingeri</i> , Hall.....	*	*	*		
<i>Crania sheldoni</i> , White.....	*	*	*	*	*
<i>Cyrtina hamiltonensis</i> , Hall.....	*	*	*	*	*
<i>Cyrtina hamiltonensis recta</i> , Hall.....	*				*
<i>Cyrtina umbonata</i> , Hall.....	*				*
<i>Gypidula comis</i> , Owen.....				*	*
<i>Lingulodiscina marginalis</i> , Whitfield.....	*	*	*	*	
<i>Nucleospira concinna</i> , Hall.....			*		
<i>Nucleospira ventricosa</i> , Hall.....				*	
<i>Orbiculoidea telleri</i> , Cleland.....				*	
<i>Orbiculoidea wardi</i> , Cleland.....	*				*
<i>Pentamerella dubia</i> , Hall.....	*	*	*	*	*
<i>Pholidostrophia iowensis</i> , Owen.....	*				*
<i>Productella subalata</i> , Hall.....					*
<i>Pugnax</i> sp.....	*		*	*	
<i>Reticularia fimbriata</i> , Conrad.....	*				*
<i>Reticularia subundifera</i> , Meek and Worthen.....	*		*	*	
<i>Rhipidomella vanuxemi</i> , Hall.....			*	*	
<i>Ræmerella grandis</i> , Vanuxem.....	*		*	*	*
<i>Schizophoria striatula</i> , Schlotheim.....	*		*		
<i>Schuchertella chemungensis</i> , Conrad.....	*		*		

	Feet. In.
<i>Spirifer asper</i> , Hall.....	* * * *
<i>Spirifer bimesialis</i> , Hall.....	* * * *
<i>Spirifer euryteines</i> , Owen.....	* * * *
<i>Spirifer iowensis</i> , Owen.....	* * * *
<i>Spirifer subvaricosus</i> , Hall and Whitfield.....	* * * *
<i>Stropheodonta concava</i> , Hall.....	* * * *
<i>Stropheodonta demissa</i> , Conrad.....	* * * *
<i>Stropheodonta perplana</i> , Conrad.....	* * * *
<i>Bellerophon pelops</i> , Hall.....	* * * *
<i>Phanerotinus exiguus</i> , Kindle.....	* * * *
<i>Platyceras dumosum</i> , Conrad.....	* * * *
<i>Pleurotomaria lucina</i> , Hall.....	* * * *
<i>Tentaculites bellulus</i> , Hall.....	* * * *
<i>Actinopteria decussata</i> , Hall.....	* * * *
<i>Aviculopecten</i> sp.....	* * * *
<i>Conocardium cuneus altum</i> , Keyes.....	* * * *
<i>Cypricardella bellistriata</i> , Conrad.....	* * * *
<i>Cypricardina indenta</i> , Conrad.....	* * * *
<i>Edmondia</i> sp.....	* * * *
<i>Goniophora</i> sp.....	* * * *
<i>Modiola</i> sp.....	* * * *
<i>Modiomorpha concentrica</i> , Hall.....	* * * *
<i>Mytilarca trigonale</i> , Cleland.....	* * * *
<i>Mytilops precedens</i> , Hall.....	* * * *
<i>Paleoneilo cf. plana</i> , Hall.....	* * * *
<i>Paracyclas elliptica</i> , Hall.....	* * * *
<i>Paracyclas lirata</i> , Conrad.....	* * * *
<i>Pterinopecten</i> sp.....	* * * *
<i>Ptychopteria eucrate</i> , Hall.....	* * * *
<i>Ptychopteria sao</i> , Hall.....	* * * *
<i>Sphenotus</i> sp.....	* * * *
<i>Gomphoceras ajax</i> , Hall.....	* * * *
<i>Gyroceras pratti</i> , Barris.....	* * * *
<i>Dalmanites barrisi</i> , Hall.....	* * * *
<i>Phacops rana</i> , Green.....	* * * *
<i>Prætus cf. occidens</i> , Hall.....	* * * *

CONCLUSION.

A study of the foregoing list of fossils found in the Devonian strata in Rock Island county leaves no doubt that they are more closely related to the fauna of the Dakotan or Northwest province of the Hamilton division of the Devonian than to the New York or Eastern province. Of the total number of ninety-seven species determined, eighty-one, or 83 per cent, are found elsewhere in the Dakotan province, and of these eighty-one species, forty-two, or 51 per cent, are found exclusively in this province. Of the fifty-five species occurring also in the Eastern province, all are widespread forms, and have a general distribution, none being distinctively Eastern species. Of the "Standard list of dominant species for the New York-Ontario province" (Eastern Middle Devonian), which Williams¹ has established, only two, *Phacops*

¹ Williams, H. S., Am. Jour. Sci., Vol. XIV, 4th ser., 1912.

rana and *Ambocoelia umbonata*, occur in the Dakotan province, and both of these are cosmopolitan forms.

Of the forty-one species listed by Hutton² from Jersey and Calhoun counties, thirty-five, or 87 per cent, are found in the Rock Island county Devonian strata, while only twenty-five, or 16 per cent, of the 151 species listed by Savage from the Hamilton strata of Jackson and Union counties of southwestern Illinois are found in the Rock Island county strata, and nearly all of the 151 species are of the Eastern province. Therefore the close relationship of the Devonian strata of Jersey and Calhoun counties and those of Rock Island county to those of the Dakotan province is conclusive proof that both belong to this province, of which they constitute the southward and eastward extension; while the similarity of the fauna of the Hamilton strata of Jackson and Union counties to that of the New York or Eastern province unquestionably proves that they form a part of that province. The land barrier shown as extending across central Illinois in Schuchert's paleogeographic map of late Hamilton time, known as the Kankakee axis, separated the basin in which the deposits of the Eastern province (including Union and Jackson counties in southwestern Illinois) were laid down, from the basin in which the Hamilton strata of Rock Island and Jersey and Calhoun counties were deposited.

The fauna of the Wisconsin Hamilton is a mixture of the faunas of the Eastern and of the Northwest or Dakotan provinces. These forms lived in an arm of the sea in which the waters of the two basins mingled. Only thirty-six, or 37 per cent, of the ninety-seven species found in Rock Island county also occur in Wisconsin, and of these thirty-six species, nineteen, or 52 per cent, occur only in the Dakotan province, while seventeen, or 48 per cent, occur in both provinces.

The Hamilton strata of the Dakotan province in Rock Island county comprise equivalents of the Wapsipinicon and Cedar Valley stages of the Hamilton in Iowa. All of those strata below and including the Phillipsastrea bed are the equivalent of the Lower and Upper Davenport divisions of the Wapsipinicon stage of the Iowa strata, the lithological characters (of which brecciation is the most conspicuous) and the stratigraphic position of these strata being the basis of correlation. The Hamilton strata

² Hutton, J. G. Thesis for degree of Master of Science in Geology in the Graduate School of the University of Illinois. The stratigraphy of the Devonian rocks of Calhoun and Jersey counties, Illinois, with a preliminary discussion of the physiography of the region.

in Rock Island county, above the level of the *Phillipsastrea* bed, are lithologically and faunally similar to the Cedar Valley strata of Iowa, and may be correlated with certainty with the rocks of that stage.

According to Hutton's unpublished thesis, the limestones of Jersey and Calhoun counties, Illinois, are of the same age as those of the Cedar Valley stage, in Iowa, lying between the *Stromatopora* reef and the *Acervularia davidsoni* zone. Consequently they may be correlated with the equivalent portion of the Rock Island county section. The upper portion of the Rock Island county strata may likewise be correlated with the Hamilton limestone of northern Missouri, which corresponds in time with the rocks of the Cedar Valley stage in Iowa.

The Rock Island county Devonian limestones are a continuation eastward of the Wapsipinicon and Cedar Valley stages of Iowa. They represent the same general period of time and the same general conditions of deposition.
