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STRATIGRAPHIC RELATIONS OF THE TOPEKA LIMESTONE IN KANSAS

By

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INTRODUCTION

The field study of the Topeka formation of the Shawnee Group of Kansas was undertaken as a group project by the members of the class in "Mid-Continent Stratigraphy" at the University of Kansas. It was carried out under the supervision of Dr. R. C. Moore.

The detailed stratigraphic relations of the several members of the Topeka limestone had not previously been understood. Especially needful were accurate correlations between the northern and southern parts of the outcrop area in Kansas.

The field study was made during the months of March, April, May and June, 1940. Three trips were taken by the members of the class to trace the Topeka limestone. One trip was to the type section, northeast of Topeka, and to nearby exposures in Jefferson and Shawnee counties. On the second trip exposures in the northern part of the state - in Doniphan and northern Atchison counties - were examined. Several weeks later an extended study of the southern exposures was made by the group. Sections were obtained in Coffey, Greenwood, Elk and Chautauqua counties. To obtain a more detailed section at the type exposure I revisited that section and checked the earlier measurements and recorded more detailed descriptions as well as collections from the individual beds. This section is especially valuable as ~~this section~~ it contains a complete sequence from the base of the Topeka limestone to above the Coal Creek Member. No other complete section was obtained in northern Kansas.

Later one day was spent in southern Shawnee and in Osage counties

With R. C. Moore, W. H. Schoewe, and C. C. Williams. This last closed the gap between northern and southern outcrops and permits accurate correlation of the lower beds of the Topeka limestone.

The exposures visited were measured in detail with Locke level and/or steel tape. Special search was made for Osagia, Ottonosia, Amblysiphonella, fusulines, molluscs, and oolitic texture. Wherever possible the measurements were made into overlying Severy shale or Howard limestone, or to the Ervine Creek limestone member of the Deer Creek formation below.

At the southern Kansas exposures Williams and I made collections of the fossils wherever possible and kept the collections of each bed separate for later study. Unfortunately in the earlier two trips many collections were either incompletely labeled, or were combined collections from several horizons at a single exposure.

The sections obtained on these trips have been drawn up at a scale of one inch equals five feet from the notes taken in the field. These sections are given in the latter part of this report and shown on the correlation chart.

I am indebted to the several members of the class for aid in the cooperative field study of the sections and to Dr. R. C. Moore who selected sections for study and made numerous valuable suggestions on the measurement, description, and correlation of the beds. Thanks are also due to R. H. King and R. M. Dudley for assistance in the identification of the brachiopods and bryozoa respectively. The specimens collected from the Topeka and adjacent formations were for the most part collected by C. C. Williams and myself, and were later studied by us.

DESCRIPTION OF THE TOPEKA LIMESTONE

Author -- E. Haworth.

Source -- The stratigraphy of the Kansas Coal Measures; The Kansas Univ. Quarterly, vol. III, no. 4, p. 278, 1895.

Original description --- "Above them (Lecompton limestone) is another shale bed about 75 feet thick, the 2 thin limestones exposed at Tecumseh, another shale bed 50-60 feet thick, and then the 3 limestone systems which appear near Topeka. Above them lies another shale bed 50 feet thick, at the top of which lies the Topeka coal."

Type locality -- (Bennett, 1897) one mile east and one mile south of Topeka, Kansas.

The Topeka limestone of Kansas, Nebraska, and Iowa is the uppermost ~~limestone~~ formation of the Shawnee Group of the Pennsylvanian Series. It is overlain by the relatively unfossiliferous Severy shale, and underlain by the Calhoun shale, or by the Ervine Creek limestone member of the Deer Creek limestone where the Calhoun shale is missing (southern Kansas). The Topeka consists of alternating limestone and shales with the basal limestone the thickest. To the south in Kansas there is found thicker shale intervals and some sandy zones. As in the other Shawnee formations the cyclic relations of the beds is apparent.

In northern Kansas the Topeka makes a significant escarpment so that good sections are often available. However between central Shawnee and Greenwood Counties the upper Topeka is present as a long dip slope and exposures of the upper beds were not found. The thickness of the Topeka as shown on the measured sections varies somewhat but is substantially thicker in the south; thickening from about twenty feet

in Doniphan County to about forty-five feet in southern Chautaugua County.

Certain beds of the Topeka are quite fossiliferous but no forms were discovered which are diagnostic of the Topeka, unless some of the fusulines are so restricted. A separate report on the fauna is being prepared with Williams.

The subdivisions of the Topeka used in this report are those of Condra and Reed (1937). Since the Sheldon limestone is now recognized as in the Topeka, these names are more in accord with present knowledge. With no personal knowledge of the tracing and correlation of the individual members in their type localities in the northern states, it is not possible to render a conclusion on the validity of these terms. Whereas Wolf River is probably a better term than "Dashner" (Moore, 1936b) for the lowermost limestone, "Hartford" may be preferable because of usage and priority. However if it is possible to restrict the Hartford to the "Curzen" (Condra and Reed, 1937) interval, the term "Hartford" would favorably replace the never stable "Curzen" limestone. It may be that the term "Hartford" is satisfactory for the entire interval with the shale thinning out to the south as seems to be indicated on the correlation chart.

The Topeka limestone is known "from southern Kansas to northern Kansas, in the Pawhuska formation in Oklahoma and forms the top of what has been called the Braddyville formation in Iowa." (Moore, 1935a) In Oklahoma the Turkey Run limestone is apparently the equivalent of the Coal Creek limestone member. The position of the lower members in Oklahoma is not exactly placed but the equivalents must occur between the Little Hominy limestone and the Turkey Run limestone (Moore, 1937).

Coal Creek Limestone Member

Author -- G. E. Condra

Source -- Condra, G. E., The stratigraphy of the Pennslyvanian system in Nebraska; Neb. Geol. Survey, Bull. 1, sec. series, p. 52, 1927.

Original Description -- Upper unit of the Topeka. "This limestone is dark blue, dense, brittle, and quite fossiliferous."

Type Area -- Exposure on Coal Creek, one half mile north of Union, Cass County, Nebraska.

Description -- The Coal Creek limestone member consists of dark blue hard limestone which weathers yellow. It occurs in thin wavy or nodular beds with shale partings. This member shows in some exposures much shale; with the limestone occurring as thin lenses or nodular masses.

This limestone is the equivalent of the other "upper limestones" of the Shawnee -- Ervine Creek, Plattsmouth, and Beil limestone members.

In southern Kansas this member is known as the "Red Lime" It is a dark blue gray massive crystalline limestone weathering reddish brown.

Fauna -- This bed is easily recognized by its abundant and well preserved fauna which readily weathers out. Both in species and individuals this member surpasses all other members of the Topeka formation, at least in the northern Kansas exposures.

Triticites cf. cullomensis
Neospirifer dunbari
Punctospirifer kentuckyensis
Composita subtilita
Bialasma bovidens
Marginifera armata
Juresania nebraskensis
Hustedia mormoni
Cancrinella boonensis
Dictyoclostus sp.
Derbya. sp.
Crania modesta
Chonetes granulifer
C. sp.
Polypora sp.
Batostomella sp.
Rhombopora sp.
Fistulipora sp.
F. nodulifera
F. incrustans
Tabulipora
Rhabdomeson
Crinoid stems and plates.

The "Red Lime" typically contains fusulines, although in some sections these are restricted to the upper few inches. Other forms are Dictyoclostus, Lophophyllum profundum, Chonetes granulifer, Marginifera armata, echinoid spines, and crinoid stems.

Holt Shale Member

Author -- G. E. Condra

Source -- Condra, G. E., The stratigraphy of the Pennsylvanian system in Nebraska; Neb. Geol. Survey, Bull. 1, sec. series, p. 52, 1927.

Original Description -- "The Holt shale, though thin, is very persistent. It is bluish and argillaceous above and black and fissile in the middle and lower portions." It includes shale between the DuBois and Coal Creek limestone members.

Type section -- Exposures near Forest City, Holt County, Missouri.

Description --- This shale is recognized by its lower portion consisting of hard black fissile shale. The upper one-third is a thin platy argillaceous gray-green shale which grades into the black shale below. Black shale of this type only occurs in the Shawnee cyclothems below the "upper limestone".

The thickness averages about three feet in northern Kansas. This shale is not recognized south of Topeka, Kansas.

Fauna -- No fossils were collected from the Holt shale member aside from a few fragmentary bryozoa near the top. Moore (1936, p. 198) reports "conodonts and some corneous brachiopods in the lower part and in places pelecypods and some calcareous brachiopods and bryozoans in the upper part."

Du Bois Limestone Member

Author -- G. E. Condra

Source -- Condra, G. E., The stratigraphy of the Pennsylvanian system in Nebraska; Neb. Geol. Survey Bull. 1, 2 nd. series, p, 52, 1927.

Original Description -- "The DuBois or third unit is one of two dark blue, dense fossiliferous limestones forming large flat blocks. Pelecypods and Fusulina are a feature."

Type area -- On Turner Creek southeast of DuBois, Pawnee County, Nebraska.

Description -- The DuBois limestone member os the Topeka formation is the most easily recognized bed in the Upper Topeka. It has the characters of a "middle limestone" ---- dark blue color on fresh exposure, weathers gray. It usually occurs as a single homogenous bed of fine grained limestone, but may consist of two limestone beds separated by a thin shale parting. In contrast to other "middle limestones" of the Shawnee group this member only rarely contains any fusulines.

The color, lithology, molluscan character together with its position below the only black shale of the Topeka limestone formation makes identification of the Du Bois both rapid and accurate.

The thickness in the area studied ranges from about three inches to over a foot. This formation has not been recognized south of Topeka, Kansas, but a molluscan , dark bed is found in several of the southern sections which may be equivalent.

Fauna -- The molluscs (gastropods and pelecypods) predominate in the Du Bois, but brachiopods and bryozoans occur occasionally. The encrusting algae Osagia is common. Fusulines are very rare, found only in one exposure. Since fossils do not weather out readily few fossils were collected from this bed. The follawin g were recognized in the field.

Myalina sp.
Derbya sp.
Linoproductus sp.
Fistulipora sp.
Dictyoclostus ? sp.
Fenestellate bryozoa
small high-spired gastropods.

Turner Creek Shale Member

Author -- G. E. Condra

Source -- Condra, G. E., The stratigraphy of the Pennsylvanian system in Nebraska; Neb. Geol. Survey, Bull 1, 2 nd. series, p. 52, 1927.

Original Description -- "3 feet or more of bluish gray calcareous shale," between the Du Bois limestone and the Curzen limestone.

Type Section -- Turner Creek, southeast of DuBois, Pawnee County, Nebraska.

Description -- The Turner Creek shale member in northern Kansas is brown to bluish- or greenish-gray in color, massive, and varies from clayey to argillaceous. Near the top thin nodular limestone layers are present in some of the sections.

The identification of this shale is dependent upon recognition of the ~~Coal Creek~~ Sheldon limestone ~~above~~ below and the Du Bois limestone ~~below~~ above. It is therefore not recognized south of Topeka, Kansas.

Fauna -- At most exposures this member is relatively unfossiliferous, but a few fossils were collected at the type section northeast of Topeka, Kansas. From one limestone in the upper part were collected Myalina, Aviculopecten sp., and Juresania sp. and abundant gastropods were seen in another limestone. Cancrinella boonensis, Rhombopora sp., and Batostomella sp. were obtained from shale near the top at the same locality,

Sheldon Limestone Member

Author -- G. E. Condra

Source -- Wondra, G. E., Neb. Geol. Survey, Bull. 3, 2 nd. Series, p. 47, 1930.

Original Description '1- 8Sheldon limestone (not the Meadow), one massive bluish gray bed or broken up; weathers buff or brownish, about 3! 5".

Type Area -- Vilas Sheldon Quarry, just east of Nehawka, Cass County, Nebraska.

Description -- The Sheldon limestone was first placed by Condra (1930) in the Calhoun shale, the term Sheldon being introduced)))) as the name of a limestone formerly correlated with the "Meadow"limestone. In 1933 Condra classed this limestone as the uppermost Deer Creek member. Moore (1936 a) classes this limestone as the middle member of the Calhoun shale. Subsequent study has shown the Sheldon to be stratigraphically higher -- between the "Curzen" and the DuBois limestone members.

It is a light gray hard massive bed which weathers light gray. It is characterized by the abundant Osagia. In northern Kansas this member is about 2.5' thick but has not been identified in southern Kansas.

Fauna -- The Sheldon member carries a fauna consisting largely of Osagia and molluscan types.

Jones Point Shale Member

Author -- G. E. Condra

Source -- Condra, G. E., The stratigraphy of the Pennsylvanian system in Nebraska: Neb. Geol. Survey, Bull. 1, sec. series, p. 51, 1927.

Original Description -- "This unit is a bluish gray, argillaceous to calcareous shale, with some carbonaceous material. It is 8-10 feet thickand quite fossiliferous. It has a rick fauna of fenestrated bryozoa, brachiopods, and pelecypods."

Type Area -- Jones Point, a spur in the Missouri River bluffs four miles east of Union, Nebraska.

Description -- The Jones Point shale member consists of the strata between the Sheldon limestone and the "Curzen" limestone. As the limestone members are not definately recognized in southern Kansas, this shale is not [illegible] there differentiated.

In the northern exposures it consists of green gray clayey shale with calcareous zones or a thin limestone near the middle. The thickness in this area is about 6 feet.

Fauna -- Both the shale and the thin limestones are in general rather fossiliferous. In the lower part are abundant fusulines and echinoid spines. The middle limestone where present contains numerous Osagia.

Composita subtilita
Dialasma bovidens
Neospirifer dunbari
Echinoconchus moorei
Chonetes granulifer
Derbya sp.
Juresania sp.
Marginifera cf. armata
?Evonia ? sp.
Polypora sp.
Rhombopora sp.
Osagia sp.
Echinoid spines
Crinoid stems.

"Curzen"Limestone Member

Author -- J. A. Gallaher

Source -- Gallaher, J. A., Missouri Bur. of Geol. and Mines, Bien. Rept., p, 57, 1898.

Orgginal description -- Underlies Forest City sand rock and overlies shale. Higher limestone than Forbes limestone-. (Wilmarth, 1938)

Type Area -- East of Curzon Station, southeast of Forest City, Holt County, Missouri.

Description -- The name "Curzen" has been used for the basal Topeka limestone beds by Condra and others but was later rejected for the term "Hartford" which had priority if these sequences were equivalent. Condra and Reed (1937) revived the term "Curzen" since they believed it not equivalent to all of the so-called "Hartford" exposed at Hartford, Kansas. As is memtioned before no attempt is made to determine the validity of these terms as used by Condra and Reed but it appears that from the published data that a restriction of the"Hartford" to this interval ("Curzen") would be more satisfactory. Ther term "Curzen" has never been accurately described or delimited, and not widely used, so it might better be left suppressed.

The "Curzen" limestone member is a massive lime bed with rare shaly partings. It is light gray, dense when fresh, and weathers brown on exposure. Black "butcher-knife" chert is found at the top of several thick sections.

Fauna -- The fauna is rather plentiful but there are relatively few species.

Triticites sp.	Ottonosia sp.
Neospirifer dunbari	Bryozoa
Echinoconchus moorei	Crinoid stems.

Iowa Point Shale Member

Author -- G. E. Condra

Source -- Condra, G. E., The stratigraphy of the Pennsylvanian system in Nebraska: Neb. Geol. Survey Bull. 1, 2 nd. series, p. 51, 1927.

Original Description ** "The shale here . . . is quite irregular, grading laterally into sand and sandstone. It carries thin lentils of coal."

Type area -- Missouri River bluffs just southeast of Iowa Point, Doniphan County, Kansas.

Description -- This shale member underlies the "Curzen" member and overlies the "Wolf River" member of the Topeka.

Typically this member has a thin soft micaceous sand at the base containing plant remains. Then there occurs a thin blue gray shale with plant fossils. The base of this shale is so carbonaceous that it almost approaches a coal. At the top occurs a zone of gray blocky shale with marine fossils.

This shale appears to thin rapidly to the south from Atchison County (2 feet thick at Topeka) and was not identified in southern Kansas.

Fauna --

Plant remains in the lower part. In the upper part the following marine forms.

Orbiculoidea capuliformis
Cancrinella boonensis or Heterolosia sp.
Neospirifer dunbari
Juresania sp.

"Wolf River" Limestone Member

Author -- G. E. cCondra and E. C. Reed

Source -- Condra, G. E. and Reed, E. C., Correlation of the members of the Shawnee Group in southeastern Nebraska, and adjacent areas in Iowa, Missouri and Kansas: Neb. Geol. Survey Bull. 11, 2nd. series, p. 51-52, 1937.

Original description --- ". . . is a new name herein applied to the lower member of the Topeka limestone formation."

Type area -- Immediately southeast of the mouth of Wolf River, north-northeast of Fanning, Kansas.

Description -- This limestone member has been formerly included in the "Curzen" member and had been called the "Dashner" limestone by Moore (1936). It was also included in the Hartford limestone member as the basal member by Moore in 1936 (1936). In 1937 it was named the Wolf River limestone member by Condra and Reed. This name probably is preferable to "Curzen" or "Dashner" although the rock exposed at Hartford, Kansas may correspond to this lower limestone. If the rock exposed at Hartford includes also (or only) the "Curzen" interval, it would be preferable to restrict that term to those beds and give consideration to the name "Wolf River".

The "Wolf River" limestone is the basal bed of the Topeka limestone formation. It typically consists of a massive light gray limestone weathering yellow buff, with a few inches of shale below and then a thin lower yellow brown crinoidal Osagia and fusuline bed. This lowermost bed containing Osagia and fusulines together is quite persistent over northern Kansas.

This limestone is traced north and south across Kansas to the Oklahoma state line with relatively little change. It seems that the Iowa Point shale above thins out southward (of Topeka) and the lower member consists of the "Curzen" and"WolfRiver" members.

Fauna*-- This massive basal limestone is characterized by the association of rare fusulines, Dictyoclostus, Ottonosia, and Amblysiphonella. Other less common forms collected at the type section northeast of Topeka follow.

1. Upper massive limestone

Composita subtilita
Neospirifer dunbari
Chonetes granulifer
Derbya sp.
Triticites sp.
Rhombopora sp.
Tabulipora sp.
Ottonosia sp.
Echinoid spines
Crinoid stems, fragments, and infrabasal circlet.

2. Thin shale

Lophophyllum profundum
Composita subtilita
Wellerella fragment
Triticites
Crinoid stems

3. Lower thin limestone

Osagia
Triticites

CORRELATION OF THE TOPEKA LIMESTONE

Method and Basis of Correlation

The forty sections are drawn up with one inch equal to five feet. The locations of the stratigraphic sections are plotted on the outline map of eastern Kansas counties. Most of these sections in their relative position (north to south) are shown on Figure 2. Numbers 17 and 18 are not included since the structural features of this exposure are not understood and correlations are not apparent. Several other sections in Osage County were ommitted since their inclusion would have entailed redrafting of the chart. The sections omitted are nearly ~~exactly~~ similar to those included.

The base of the Topeka formation is chosen as a datum since it is that part of the section most commonly present in the sections and is easily recognized in the northern and most of the southern Kansas sections. Shorter north Kansas sections not reaching to the Calhoun shale are drawn up with the relatively easily distinguished Du Bois member equivalent. The horizon of the fossiliferous Coal Creek limestone member, the "red lime", the chert horizons, and the Rhombopora, Amblysiphonella, and echinoid spine zones are also useful in correlating adjacent sections. The massive layer containing Amblysiphonella and Ottonosia is traceable from north Kansas to the Kansas - Oklahoma boundary with practically no change in the fauna or appearance of the bed.

On the chart have been included nearly all the sections measured. By the elimination of some correlation would be simpler, but perhaps less accurate and significant details might be missed. Sections 19 and 24 are especially doubtfully correlated. The limestone at the top

of section no. 10 was mainly covered so no subdivision is possible in this section.

The names of the units in the north are indicated using those of Condra and Reed (1937) for clarity. In the south are questionably listed highly speculative correlatives, which are discussed later. (The actual correspondence of these beds is regarded as merely speculative since the evidence is of little value.)

Conclusions

The correlation of the Topeka sections as far south as Topeka, Kansas is relatively exact. The members have been named after those in Nebraska and each member is found in the separate sections. The following members are recognized (from top to base). Coal Creek ls., Holt shale, DuBois limestone, Turner Creek shale, Sheldon limestone, Jones Point shale, "Curzen" limestone, Iowa Point shale, and "Wolf River" limestone.

Although the upper limestone member (Coal Creek) and the basal ("Wolf River") member are recognized across Kansas, the intervening beds have not been identified south. of Topeka, Kansas. At one exposure in Osage County Chonetes granulifer (? var. emaciata) and pelecypods were found in a shale(containing no limestones) a considerable distance above the basal Topeka limestone. This shale is considered in the Topeka since the Severy shale is conspicuously unfossiliferous above the top of the Topeka. It may be that the middle and upper Topeka limestones grade into shale southward and new limestones come in farther south. Due to this lack of recognition of these beds it is not possible to recognize the northern Kansas units in the south. The sandy zone in the southern exposures may correspond to the horizon of plant remains in the Turner Creek

shale in the northern exposures. From the sections and correlations it appears that the "Curzen" limestone member either pinches out, or more likely, unites with the "Wolf River" limestone member due to the thinning of the Iowa Point shale. On the basis of these possiblities it is possible to reughly correlate the southern and northern Kansas sections. The Coal Creek member is continuous in the south. Below this lies shale and a thin molluscan limestone. This molluscan limestone might be correlated to the DuBois. Below this another shale and then a limestone containing Osagia abundantly and molluscs, suggestive of the Sheldon limestone member. The "Curzen"-"Wolf River" interval is at the base.

Although this yields the same sequence of beds as in the north, it is felt that any such correlation is based upon insufficient evidence and fortuitous reasoning, and therefore these beds are considered only as the Holt-Jones Point (Iowa Point ?) interval.

In the Calhoun shale a persistant molluscan (oatmeal) Osagia limestone is found from Osage to Greenwood Counties, and questionably recognized in somewhat different form in Doniphan County. If a subdivision of the Calhoun shale were advisable or useful, this limestone would serve as a distinctive dividing bed.

The Calhoun shale as a whole is seen to thin both to the north and south, with the greatest thickness in Shawnee County. At a place near where measurements were taken at stratigraphic section no. 30 the Ervine Creek limestone member of the Deer Creek is seen directly under basal Topeka limestone.

Especially noticable in the correlation was the lower bed containing Amblysiphonella, Ottonosia, Dictyoclostus, and fusulines which was found all through the north-south outcrop area. Other thin beds or faunal

features are found to be very persistent in the Topeka limestone. However in the upper Topeka the stratigraphy is not as clear.

Other minor ideas of correlation as well as these major ones may be seen of the correlation chart.

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MARSHALL
NEMAHA
BROWN
DONIPHAN
ATCHISON
JACKSON
POTTAWOTOMIE
JEFFERSON
LEAVENWORTH
WYANDOTTE
GEARY
WABAUNSEE
SHAWNEE
JOHNSON
DOUGLAS
MORRIS
OSAGE
FRANKLIN
MIAMI
LYON
CHASE
COFFEY
ANDERSON
LINN
WOODSON
ALLEN
BOURBON
GREENWOOD
WILSON
NEOSHO
CRAWFORD
ELK
CHAUTAUQUA
MONTGOMERY
LABETTE
CHEROKEE

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31.

A B C D E,F G H I J

Location of
Measured Sections
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Figure 1.