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CORRELATION OF THE MEMBERS OF THE TOPEKA FORMATION IN A NORTH-SOUTH SECTION ACROSS KANSAS

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Introduction

The following attempt to correlate the members of the Topeka formation across Kansas is based mainly upon measurements and descriptions of beds made by the members of the stratigraphy class of the University of Kansas during the spring of 1940, supplemented to some extent by observations in the field which, however, have not been verified by careful study.

On the basis of the information at hand it is impossible to arrive at a satisfactory conclusion regarding the correlation. It is hoped, therefore, that this report will be considered merely a statement of one or two of the correlations which seem possible on the basis of the amount and nature of data available. It is expected that it will be modified considerably by field studies to be carried out in the near future.

Description of Formations

For the purpose of this study the exposure of the Topeka limestone in Sec. 6, T. 11 S., R. 16 E, in Shawnee county, Kansas, is considered the type section. Here five members of the Topeka are exposed. Named in upward order they are the Hartford limestone, the Turner Creek shale, the Du Bois limestone, the Holt shale, and the Coal Creek limestone.

The Hartford limestone member is immediately underlain by the Calhoun shale. The lower part exposed at this locality consists of a massive sandstone of unknown thickness. This was overlain by 25.7 feet of gray, sandy shale containing a thin coal bed a few inches from the top. The lowermost bed of the Hartford member consistsof a bed of fossiliferous limestone 5 inches thick. This bed contains fusulinids in the lower part and Osagia in the upper part. This bed is immediately overlain by shale which is dark gray at the base and green at the top. Immediately overlying this shale is a massive limestone bed containing many fusulinids. It is cream colored on fresh fracture but weathers

to deep buff color. The next bed in upward order is a sandy micaceous shale containing an abundance of plant remains. The thickness of the shale is approximately 8 feet. Next above the sandy shale is a gray, massive limestone 6.8 feet thick which contains fusulinids throughout. Osagia is plentiful except in the lowermost part. A layer of brown chert is present 5 feet above the base. Next in order above the limestone is a thin-bedded, limy shale 2 feet thick containing numerous bryozoa. The next bed of the Hartford member is nodular, algal, buff limestone 1 foot thick, followed by 4.3 feet of greenish-grey shale. This is overlain by a thin-bedded limestone, the lower part of which consists of massive buff limestone containing Osagia.

The Turner Creek shale consists of 1.7 feet of gray clay shale. This is immediately overlain by the lowest bed of the Du Bois limestone which consists of .8 feet of light grey limestone containing a molluscan fauna. The middle bed of the Du Bois consists of a thin-bedded limestone and shale containing many Myalina and brachiopods,, 1.6 feet thick. The upper bed of the Du Bois is 0.6 feet thick. It is dense, massive, and has a

characteristic blue color. It contains many Derbya and small, high-spired gastropods.

The Holt shale is 4' thick. It consists of a black, fissile shale in the lower part and a buff clay shale above.

The Holt shale is immediately overlain by the Coal Creek limestone. This limestone is buff, thin-bedded and is very fossiliferous. The exposure at the type locality is very poor but it is estimated that the thickness is about 2 feet.

D E S C R I P T I O N

O F

M E A S U R E D S E C T I O N S

Description of Measured Sections

	Number 1	Sec. 3, T. 4 S., R. 19 E. Doniphan County, Kansas	
Bed 12	Limestone	Gray, fine-grained. Abundant mollusks.	1'
Bed 11	Shale	Covered	4' 6"
Bed 10	Limestone	Gray, weathering brown. Mollusks in lower part.	1' 8"
Bed 9	Shale	Gray to green.	1' 8"
Bed 8	Limestone	Brown, argillaceous	1' 9"
Bed 7	Shale	Calcareous, weathers brown.	1' 5"
Bed 6	Limestone	Gray, weathering buff massive to irregularly bedded. Siliceous fossils in upper part.	4' 9"
Bed 5	Shale	Sandy, micaceous, mostly covered, carbonaceous material.	8'
Bed 4	Limestone	Massive, fusulinids, honeycomb weathering.	2' 8"
Bed 3	Shale	Dark grey at base, green above, calcareous.	7"
Bed 2	Limestone	Gray, wavy beds. Bryozoa, crinoids.	5"
Bed 1	Shale		
	Number 2	Sec. 11, T. 5 S., R. 19 E. Atchison County, Kansas	
Bed 16	Sandstone		3'
Bed 15	Shale	Covered	30' 2"

Bed 14	Limestone	Covered. Fusulinids, bryozoa and brachiopods.	15"
Bed 13	Limestone	Nodular, fossiliferous.	5"
Bed 12	Shale	Gray, plastic	3' 2"
Bed 11	Limestone	Massive, grey	11"
Bed 10	Shale		4' 4"
Bed 9	Limestone	Oölitic, granular	1' 10"
Bed 8	Shale and limestone	Echinoids	3' 7"
Bed 7	Limestone	Fragmental, crinoids, black chert.	2'
Bed 6	Limestone	Osagia.	2'
Bed 5	Limestone	Gray, fusulinids	1'
Bed 4	Shale	Chocolate, micaceous. Bryozoa and Derbya in upper half.	6"
Bed 3	Silt	Gray, weathers brown.	3"
Bed 2	Limestone	Nodular, sandy	4"
Bed 1	Shale	Sandy, micaceous, resting on blue-green plastic shale.	3"

Number 3 — SW¼ Sec 2, T. 8 S., R. 19 E. Jefferson County, Kansas

Bed 14	Shale		3'
Bed 13	Limestone		0.2'
Bed 12	Shale	Echinoidsspines Crinoid plates.	2.2'
Bed 11	Limestone		3.15'
Bed 10	Shale		0.4'

Bed 9	Limestone		0.7'
Bed 8	Shale		0.1'
Bed 7	Limestone		0.5'
Bed 6	Shale		0.8'
Bed 5	Limestone		3.3'
Bed 4	Shale	Green	0.2'
Bed 3	Limestone		0.3'
Bed 2	Shale		0.9'
Bed 1	Sand		2.7'

Number 4 — Sec. 16, T. 11 S., R. 16 E. Shawnee County, Kansas Type Section

Bed 16	Limestone	Buff, thin-bedded, fossiliferous, fusulinids. (Coal Creek)	2'
Bed 15	Shale	Buff above, black, fissile below. (Holt)	4'
Bed 14	Limestone	Blue, Derbya, gastropods.	6'
Bed 13	Limestone and shale	Thin-bedded. Myalina, Brachiopods.	1.6'
Bed 12	Limestone	Gray, molluscan fauna--gastropods.	0.8'
Bed 11	Shale	Gray	1.7'
Bed 10	Limestone	Massive, buff, Osagia.	1.7'
Bed 9	Shale	Greenish gray	4.3'
Bed 8	Limestone	Nodular, algal, buff. Osagia.	1'

Bed 7	Limestone and shale	Thin-bedded, bryozoa.	2'
Bed 6	Limestone	Gray, massive, weathering brown. Fusulinids throughout. Osagia present except in lower 1½ feet. Chert layer 5' above base.	6.8'
Bed 5	Shale	Plants. 2" micaceous sandstone at base.	2.1'
Bed 4	Limestone	Gray, massive, weathering brown, crinoidal.	0.5'
Bed 3	Shale	Buff	0.5'
Bed 2	Limestone	Gray, slender fusulinids. Osagia in upper part.	0.5'
Bed 1	Shale	25.7 feet to sandstone of Calhoun.	
	Number 5	NW¼ Sec. 14, T. 12 S., R. 17 E. Shawnee County, Kansas	
Bed 6	Limestone	Fusulinids	1.8'
Bed 5	Shale	Green-yellow	0.7'
Bed 4	Limestone		3.6'
Bed 3	Shale	Blue	15.6'
Bed 2	Sandstone		22'
Bed 1	Shale	Sandy. Underlain by a limestone.	18.8'
	Number 6	SW¼ SE¼ Sec. 7, T. 19 S., R. 15 E. Coffey County, Kansas	
Bed 5	Limestone	White, thin-bedded, wavy bedding planes, abundant fusulinids.	2'

Bed 4	Limestone	Brown. Amblysiphonella corals, crinoid stems.	2'	
Bed 3	Shale	Blue-gray, plastic, partly covered.	16'	4"
Bed 2	Limestone	Brown. Fossil fragments. Fusulinids.	1'	
Bed 1	Sandstone	Fine-grained, buff.	1'	
	Number 7	Sec. 10, T. 19 S, R. 15 E. Coffey County, Kansas		
Bed 6	Sandstone	Gray, fine-grained, massive.	1'	
Bed 5	Limestone	Gray, weathering to brown. Amblysiphonella, Ottonosia, brachiopods, etc.	2'	7"
Bed 4	Shale	Greenish gray	6'	6"
Bed 3	Limestone	White, fusulinids		4"
Bed 2	Shale	Upper 8" marine fossils, Derbya, Rhombopora. Dark shale below with plant remains.	6'	
Bed 1	Sandstone	Buff	2'	
	Number 8	SE¼ SW¼ Sec. 36, T. 20 S., R. 13 E. Coffey County, Kansas		
Bed 7	Limestone	White, wavy nodular, algal, brecciated appearance.	2'	6" exposed
Bed 6	Limestone	Massive, gray, weathers brown. Ottonosia abundant.	1'	5"

Bed 5	Shale	Blue	3'	7"
Bed 4	Limestone	Buff, earthy, dense		5"
Bed 3	Shale	Blue, upper part with bryozoa. Derbya, Neospirifer.	3'	
Bed 2	Limestone	Gray, Myalina.		10"
Bed 1	Limestone	Gray, Cephalopods, Osagia, abundant. Myalina.	1'	

Number 9 — NE¼ NW¼ Sec. 36, T. 20 S., R. 13 E. Coffey County, Kansas S. E. of Hartford in West side of Road.

Bed 6	Limestone	Nodular, brown and white, irregularly bedded.	4'	
Bed 5		Covered	13'	3"
Bed 4	Limestone	Osagia , above which is "oatmeal" bed and basal lime of next section. This bed may represent 1 and 2 below.	1'	
Bed 3	Sandstone	Brown, fine-grained, ferruginous. Partly covered.	16'	
Bed 2	Limestone	Brown. Molluscan fauna.	1'	
Bed 1	Limestone	Black		6"

Number 10 — NE¼ NW¼ Sec. 36, T. 20 S., R. 13 E. Coffey County, Kansas SE of Hartford. Measured in the Road.

Bed 5	Limestone	White, fusulinids, cephalopods gastropods.	2'	
Bed 4	Shale and limestone	Thin beds of limestone. Thin, black septaria.	28'	

Bed 3	Limestone	Septaria	6"
Bed 2	Shale	Blue-gray, covered.	10' 2"
Bed 1	Limestone	Black, earthy. Underlain by platy, grey to buff shale to creek bottom.	5"
	Number 11	NE¼ SW¼ Sec. 1, T. 23 S., R. 12 E. Greenwood County, Kansas	
Bed 5	Limestone	Massive, gray, abundant Ottonosia in lower part.	10'
Bed 4		Covered	
Bed 3	Limestone	Nodular, brachiopods Osagia, Myalina.	1' 5"
Bed 2	Shale	Lower part not exposed.	3'
Bed 1	Sandstone	Buff	5'
	Number 12	SE¼ SW¼ Sec. 25, T. 25 S., R. 11 E. Greenwood County, Kansas	
Bed 13	Limestone	Fusulinids. Derbya, Dictyoclostus, crinoid stems, bryozoa, Chonetes.	
Bed 12	Shale	Yellow, calcareous	3'
Bed 11	Limestone	Gray, weathering brown. Mollusks, Osagia.	1'
Bed 10	Shale	Mostly covered	
Bed 9	Shale	Yellow, calcareous with impure limestone beds. Lower limestone with brachiopods.	5' 6"
Bed 8	Shale	With thin limestone beds.	6'
Bed 7	Limestone	Gray, Osagia at top. Abundant fusulinids in middle. Derbya, Dictyoclostus, Osagia at base.	3' 6"

Bed 6	Limestone	Blue-gray, massive. Ottonosia, productids, Polypora.	1' 2"
Bed 5	Shale	Calcareous	6"
Bed 4	Limestone	Blue, massive, Crinoids. Brachiopods, (Ottonosia).	9"
Bed 3	Shale	Covered	9'
Bed 2	Limestone	Weathers brown. Wavy bedding planes. Dictyoclostus, bryozoa, Ottonosia abundant. Crinoids.	3'
Bed 1	Shale	Sandy. Weathers brown. Myalina, Derbya.	4'

Number 13 — NE¼ NW¼ Sec. 3, T. 30 S., R. 11 E. Elk County, Kansas

Bed 12	Sandstone	Fine, buff, weathers brown.	3' 7"
Bed 11	Limestone	Sandy. Rhombopora zone.	10"
Bed 10	Limestone	Thin, blue shales. Fossiliferous.	5' 10"
Bed 9	Limestone	Thin, wavy beds with shale partings. Brachiopods.	13"
Bed 8	Limestone and shale		10"
Bed 7	Limestone	Gray. Syringopora.	6' 5"
Bed 6	Shale		3"
Bed 5	Limestone	Ottonosia, fusulinids, Amblysiphonella.	11"
Bed 4	Shale	Gray	5"
Bed 3	Limestone	Fusulinids and brachiopods	11"
Bed 2	Shale	Plastic, gray	6"
Bed 1	Limestone	Wavy, thin-bedded.	1'

	Number 14	Sec. 6, T. 30 S., R. 11 E. Elk County, Kansas Road Section near Howard.	
Bed 8	Limestone	Buff, weathering brown. Fusulinids.	9'
Bed 7	Shale	Mostly covered. Abundant Rhombopora at top.	4' 8"
Bed 6	Shale		12' 3"
Bed 5	Limestone	Gray, dense.	6"
Bed 4		Covered	7' 6"
Bed 3	Limestone	Grayish blue. Fusulinids, Ottonosia.	1'
Bed 2		Covered	8' 8"
Bed 1	Limestone	Gray, Wavy, Ottonosia. (Ervine Creek)	1'
	Number 15	Sec. 11, T. 31 S., R. 10 E. Elk County, Kansas	
Bed 6	Limestone	Gray, weathering brown, thin-bedded, wavy. Abundant fusulinids.	2' 7"
Bed 5	Shale	Poorly exposed. Abundant Rhombopora at top.	21' 10"
Bed 4	Limestone	Thin, wavy bedded. Fusulinids, gastropods, Derbya.	3'
Bed 3	Limestone	Gray. Fusulinids.	10"
Bed 2	Sandstone	Gray, massive, fine, hard. Pleurophorus.	18' 5"
Bed 1	Limestone	Sandy. Rhombopora zone.	8"

	Number 16	NE¼ NW¼ Sec. 8, T. 34 S., R. 10 E. Chautauqua County, Kansas Along Highway 66	
Bed 8	Sandstone	Buff, weathering to red-brown.	1' est.
Bed 7	Limestone and shale	Nodular, buff. Fusulinids	7'
Bed 6		Covered	4'
Bed 5	Limestone	Dense, blue, weathers brown. Ottonosia, fusulinids.	2'
Bed 4		Covered	24"
Bed 3	Limestone	Gray to buff, dense Ottonosia, fusulinids, Brachiopods.	10"
Bed 2		Covered	2' 5"
Bed 1	Limestone	Nodular, gray to white. Fusulinids.	1'
	Number 17	NW¼ Sec. 8, T. 34 S., R. 10 E. Chautauqua County, Kansas ½ mile west of previous section on highway 66.	
Bed 8	Limestone	Brown, dense, sandy.	2'
Bed 7	Shale	Buff with thin fossiliferous limestone.	7' 2"
Bed 6	Shale	Blue	3'3"
Bed 5	Limestone	Thin-bedded, base not exposed. Fusulinids.	1'
Bed 4		Covered	3' 10"
Bed 3	Limestone	Osagia abundant. Myalina.	1'
Bed 2		Covered	5' 6"
Bed 1	Sandstone	With one thin limestone lense. Ferruginous. Pelecypods.	2' 8"

	Number 18	Sec. 10, T. 35 S., R. 9 E. Chautauqua County, Kansas	
Bed 10	Limestone	(Church)	2'
Bed 9	Shale		3'
Bed 8	Limestone	(Wauneta)	1'
Bed 7	Shale		4'
Bed 6	Limestone	(Bachelor Creek)	0.5'
Bed 5	Shale	Very sandy	64'
Bed 4	Shale	Limestone bed at top, 1' thick. 1' sandstone bed 5 feet from base. Osagia.	24.5'
Bed 3	Limestone	Shale break in middle. Fusulinids. Osagia. (Topeka)	5.6'
Bed 2	Limestone and shale	(Calhoun shale). Shale interbedded with thin limestones. The limestones contain brachiopods, gastropods, fusulinids, echinoids spines and Osagia.	39.4'
Bed 1	Limestone	(Deer Creek). Ottonosia.	2'

Discussion of Correlation

On the basis of the above measured sections the beds comprising the Topeka formation are correlated as shown in the graphic sections accompanying this report. In making the correlations in this manner it is assumed that the Hartford member is persistent across the state and that it maintains its relatively greater thickness throughout the entire distance. Whether or not this is justifiable is highly debatable. It is obvious that such an assumption should be substantiated by more detailed information.

The Hartford limestone member increases in thickness towards the south, apparently by the addition of shale beds. At the extreme southern edge of the state most of the limestone has been replaced by shale or sand with the exception of a few feet at the base.

The greenish-gray Turner Creek shale immediately overlying the Hartford limestone member varies in thickness from 1.7' at the type locality to a probable thickness of 6 feet in sec. 25, T. 25 S., R. 11 E.

in Greenwood County, Kansas, and then thins. Farther south it is not distinguishable from the other shales comprising the Topeka formation.

The Du Bois limestone ranges from about $2\frac{1}{2}$ feet at the type locality to 1 foot in Atchison county, Kansas. In Sec. 8, T. 34 S., R. 10 E., Chautauqua County, the thickness is approximately 2 feet but apparently it disappears entirely six miles to the west in sec. 10, T. 35 S., R. 9 E.

The Du Bois member is absent over a great deal of the area both north and south of the type locality which makes its recognition with any degree of certainty extremely difficult. Furthermore, the thinness of this member, especially in the presence of other similarly thin beds makes it almost impossible to differentiate it on the basis of thickness or stratigraphic position. The bed near the southern boundary of the state which is called the Du Bois in this report does not resemble the Du Bois of the northern part of the state. It is very likely that this correlation is erroneous. The only basis for correlating it with the

Du Bois is that it immediately underlies a shale which in turn underlies a limestone which is considered to be the Coal Creek limestone member.

On the basis of stratigraphic position alone the shale member in the Topeka formation is correlated the entire distance across the state with the Holt shale.

A thin-bedded limestone at the top of the Topeka formation in the southern part of Kansas is correlated with the Coal Creek limestone of the type locality. As in the case of the Du Bois limestone and Holt shale this formation is absent across the greater part of the state. Hence it is extremely doubtful as to whether stratigraphic position is sufficient evidence for correlating the uppermost member in the wouthern part of the state with the uppermost member in the type locality in the absence of more specific evidence.

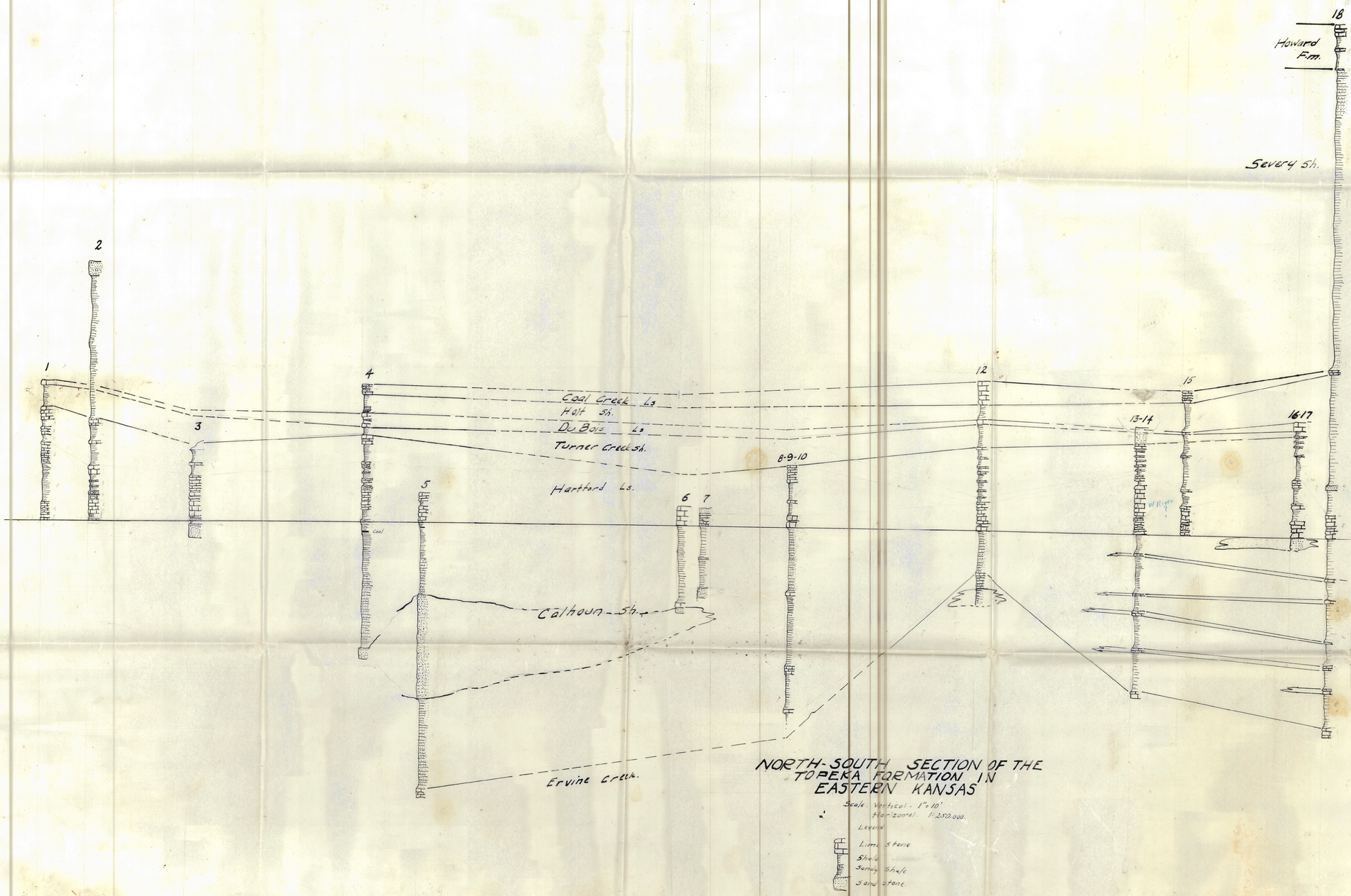
Objections to This Correlation

In addition to the objections cited in the discussion of the section it is difficult to explain the addition of five or six limestone beds in the Calhoun shale immediately underlying the Topeka formation.

This is especially difficult in view of the fact that most Pennsylvanian beds are considered to grade into shales and sandstones southward rather than become more limy as is inferred by the addition of these beds. Furthermore, these thin limes are very fossiliferous in the southern part of the state. It is difficult to explain the addition of many marine fossils in an otherwise dominantly continental deposit, especially when these invertebrates are introduced in the direction from which it is supposed the sediments were derived.

An alternate correlation would be to place the thin limestone members, which in the section are correlated with the upper part of the Calhoun shale, with the lowermost Topeka, thus decreasing the interval between the base of the Topeka and the Ervine Creek to approximately 10 feet rather than 40 feet as indicated in the graphic section.

An objectionn to this correlation would be that the abundant Rhomboporoid bryozoa and chonetids present in the thin limestone beds and intervening shales were not found in careful examination of shales present in the Hartford member further north.



NORTH-SOUTH SECTION OF THE TOPEKA FORMATION IN EASTERN KANSAS

Scale. Vertical - 1"= 10'
Horizontal 1:250,000.

Legend
Limestone
Shale
Sandy Shale
Sand Stone