THE TRAVIS PEAK FORMATION

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THESIS

Presented to the Faculty of the
Graduate School of the University
of Texas in Partial Fulfill-
ment of the Requirements

For the Degree of

MASTER OF ARTS

By

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Austin, Texas

June, 1928

ACKNOWLEDGEMENT

Notes, suggestions, and fossil collections made by Professor F.L. Whitney have proved of much assistance in the preparation of this thesis.

THE TRAVIS PEAK FORMATION

The purpose of this thesis is to present the worthwhile published information on the Travis Peak formation together with the writer's knowledge of this formation. Little attention has been given to the Travis Peak formation, partly due to the difficulty entailed in separating it from the formation which directly overlies it, and partly due to the absence of accurate knowledge regarding the formation.

The divisions of the Cretaceous period in Texas are as follows:

Upper Cretaceous or Gulf Series	(Montana Division (Colorado Division (Dakota Division
Lower Cretaceous or Comanchean	(Washita Division (Fredericksburg (Division (Trinity Division

The Trinity division is subdivided into the following formations:

Trinity division	(Paluxy formation (Glen Rose formation (Basement sands and equivalent formations.

The Travis Peak formation is the term applied to that part of the Basement sands existing in and south of Burnet County, Texas.

Coming from the south across Mexico the Trinity

epicontental sea first reached the Texas borders in the region of Presidio del Norte on the Rio Grande. Gravel and sand deposited in this region constitute the lowest Cretaceous beds of which there is any knowledge in Texas. From the border area there was a gradual extension of the waters to the north and a deepening of the waters to the south. The sea was shallow and encroached rapidly upon the older rocks. Sands and conglomerates indicate the shallow, near shore conditions and the rapid encroachment of the early Trinity sea. The Palaeozoic floor upon which the Trinity sea encroached rises gently to the north and west. Incident to this the basement sands are by no means of the same age in all localities. The Basement sands become younger and younger in age as they progress across Texas, and it is very probable that the Basement sands of north Texas, Kansas, and New Mexico are even later than Trinity in age, although they represent the first encroachment of the Cretaceous sea.

The old continental shield, Llanoria, possibly extended all over east Texas, west Louisiana, and south Arkansas. In Texas this old land mass is supposed to have formed the southern and eastern boun-

daries of the epicontinental seas of early Cretaceous times.

The chief sources of supply of Trinity sediments were: (1) Llanoria; (2) the upturned Palaeozoics of the Ouachita Mountains; (3) the Llano Uplift; (4) the older sedimentary formations in general. The Travis Peak formation contains coarse rounded pebbles of Cambro-Ordovician limestones, granite, schists, and quartz derived from the adjacent Palaeozoic rocks.

There was a gradual subsidence of the land during the time of deposition of the Travis Peak formation. With a deepening of the waters the deposits changed from conglomerates and coarse sands to finer material, becoming more calcareous at the top. The Travis Peak passes almost imperceptibly into the Glen Rose formation which is composed largely of calcareous material.

Incident to being deposited on an uneven sea bottom, the Travis Peak formation is by no means uniform in thickness. It thickens to the east and to the south. In central Burnet County the average thickness of the formation is less than fifty feet. In northern Burnet County the Travis Peak is entire-

ly missing, and the Walnut formation lies unconformably on the Ellenberger (Cambro-Ordovician) formation. At the type section near the Travis Peak post-office, Burnet County, the formation is two hundred and sixty-three feet thick.[1] The log of the State Insane Asylum well at Austin shows it to be four hundred and ninety feet in thickness. Nineteen miles northwest of Fredericksburg the Travis Peak is approximately one hundred feet thick, while at Fredericksburg it is approximately one hundred and seventy-five feet thick.[2] A well drilled on the Leon Springs Reservation in Bexar County, starting in the Glen Rose formation, passed entirely through the Travis Peak formation and into underlying schists. Alexander Deussen has assigned the bottome four hundred and eighty feet of strata in this well to the Travis Peak formation.

The Travis Peak formation was named by R. T. Hill. The name Travis Peak was given because of the excellent exposures of this formation in the vicinity of the Travis Peak post-office, Burnet

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1 Hill, R.T.: "Geography and Geology of the Black and Grand Prairies, Texas," 21st Ann. Rept. U.S. Geological Survey, Pt. 7, 1900, pp. 503, 507, 508.

2 Sellards, E.H.: "The Geology and Mineral Resources of Bexar County," Univ. of Texas Bull. 1932, 1919, pp. 21, 22.

County. The following section, by J.A. Taff,[3] in which Hill[4] interpolates the division and formation names, will give an idea of the sequence and composition of the formation as a whole, as exposed in the valley of the Colorado River, between Travis Peak post-office and Smithwick Mill, Burnet County.

Hickory Creek Section of the Travis Peak Formation, beginning at the top of the divide between Hickory and Cow Creeks and continuing to the Colorado River level at the mouth of the Hickory Creek, Burnet County.

	Thickness Feet	Total Depth to bottom of strata Feet
Glen Rose formation:		
Travis Peak formation:		
12. Bands of conglomerate and calcareous sandstone, alternating with beds of arenaceous limestone, the arenaceous limestone predominating	40	40
Hensell sand:		
11. Marly magnesian limestone	40	80

[3] Taff, J.A.: "Reports on the Cretaceous Area North of the Colorado River," 3rd Ann. Rept. Geol. Survey of Texas, 1891, pp. 295-296.

[4] Hill, R.T.: "Geography and Geology of the Black and Grand Prairies, Texas," 21st Ann. Rept. U.S. Geol. Survey, 1900, p. 141.

10. Calcareous sand at base, grading upward to a siliceous limestone at the top, barren of fossils	55	135
9. Yellow calcareous sand, stratified	15	150
8. Conglomerate, similar in character to No.2, with the exception that the pebbles are smaller and more worn, grading into sand below and calcareous sand above	25	175
7. Red sand, unconsolidated...	3	178
6. Friable yellow sand	5	183
Cow Creek beds:		
5. Cross-bedded shell breccia, containing many small rounded grains and pebbles of quartz flint and granite sand. Fossils: Trigonia and small bivalves and Ammonites justinae	7	190
4. Ostrea beds, magnesian lime cement, fossils en masse ..	3	193
3. Brecciated grit, composed of worn fragments of oyster shells and shells of other Mollusca, with sand and pebbles stratified in false beds.	5	198
2. Bands of friable bluish shale and calcareous sand, stratified; fragments of oyster shells are common in calcareous sandstone	15	213
Sycamore sand:		
1. Basal conglomerate of pebbles of limestone, quartz, chert, granite and schist, wellrounded, in a cement of ferruginous yellow and red gritty sand. Some of the pebbles at the base are from 4 to 6 inches in diameter. They decrease in size, however, upward from the base, until we obtain a false bedded calcareous grit at the top	50	263

Total Thickness of Travis Peak beds 263

Carboniferous:

O. Laminated, flaggy, carboniferous sandstones and friable light-blue clay of Carboniferous(Coal measures) age, from the Colorado river level upward to the base of the Trinity conglomerate, the laminated sandstones containing prints of ferns, nearly 100 363

[5]At the top of the sandy beds a yellow, arenaceous, fossiliferous limestone appears. This marks the first or lowest appearance of the peculiar fossils Monopleura and Requienia (Caprotina), and indicates the beginning of the Glen Rose formation.

The lowest division of the Travis Peak formation, the Sycamore sand, is, in a general way, persistent throughout the horizontal extent of the formation. The Sycamore division consists of conglomeratic materials and sands. This division is barren of fossils, and varies locally in thickness and character. In the vicinity of the type section the division is fifty feet in thickness. At Austin, according to the log of the State InsaneAsylum well,this division is approximately three hundred feet thick.

The Cow Creek beds constitute the division im-

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[5] Ibid, p. 144.

mediately above the Sycamore division. The Cow Creek beds are composed of clay, calcareous sand, and arenaceous limestone, and are very fossiliferous. The following section of the Cow Creek at the type section of the Travis Peak formation shows the character of these beds and the stratigraphic relation of the fauna.

Cow Creek Beds:	Feet
4. Cross-bedded shell breccia, containing many small rounded grains of quartz and granite sand. Fossils: Dufrenoya justinae (Hill), an undeterminable fragment of ammonite probably Douvilleiceras, an undescribed species of Trigonia (2), Cyrena, Tapes, Corbicula, Pinna, Astrocoenia, and Shark's tooth	7
3. Ostrea beds, magnesian lime cement. Fossils: two undescribed species of Ostrea	3
2. Brecciated grit, composed of worn fragments of Ostrea and other Mollusca, with sand and fine pebbles stratified in false beds. Fossils: Ostrea similar to O. franklini var. ragsdalei (Hill), Cucullaea terminalis (Conrad), Cardium (Protocardia) texanum (Conrad).....	5
1. Bands of friable bluish shale and calcareous sand, stratified. Fossils: Fragments of Ostrea, Exogyra weatherfordensis (Cragin), Gryphaea wardi (Hill and Vaughan)	15
Total thickness of Cow Creek beds ...	30

The following is a section of the Cow Creek beds as exposed in the cliffs at Hammett's Crossing on the Pedernalis River, Hays County:

Cow Creek beds:	Feet
4. Massive shell breccia, containing an abundance of rounded and subangular sand grains. Fossils: Dufrenoya justinae (Hill), Cardium (Protocardia) texanum (Conrad), two undescribed species of Trigonia identical with the two species of Trigonia in the Cow Creek beds of the type section, an undescribed species of Gervillia	9
3. Ostrea beds, arenaceous lime cement. Fossils: Same species of Ostrea encountered in Cow Creek beds at the type section	4
2. Shell breccia with subangular sand grains and calcareous sand. Fossils: Cucullaea terminalis (Conrad), undescribed species of Homomoya, Aporrhais, Nerinea	7
1. Yellow and bluish clay with some calcareous sand. Fossils: fragments of Ostrea, Exogyra weatherfordensis (Cragin), Gryphaea wardi (Hill and Vaughan)	19
Total Thickness of the Cow Creek beds at this locality	39

The following section of the Cow Creek beds will give an idea of the fauna and composition of these beds as exposed on the cliffs of the Pedernalis River two miles east of Cox's Crossing, Travis County:

Cow Creek beds:	Feet
4. Shell breccia containing an abundance of calcareous sand. Fossils: Chione (?) decepta (Hill), and undetermined Shark's tooth different from the one found in the Cow Creek beds of the type section, two species of Trigonia identical with the species previously listed, two species of Gervillia, one of which is identical with the species in the preceeding section of the Cow Creek beds, undescribed species of Protocardia, Cucullaea, Ptychomya...	9
3. Ostrea beds, lime cement. Fossils: same species of Ostrea encountered in the previous sections of the Cow Creek beds..	3
2. Sands and calcareous sands containing many small fragments of shells. Fossils: Cucullaea terminalis (Conrad), an undescribed species of Lunatia, an undescribed species of Aporrhais identical with the species of Aporrhais from the preceeding section of the Cow Creek beds	6
1. Yellow clay and calcareous sand. Fossils: fragments of Ostrea, Exogyra weatherfordensis (Cragin), Gryphaea wardi (Hill and Vaughan)..	16
Total Thickness of the Cow Creek beds in this locality	34

In the surrounding cliffs of Dead Man's Hole, Hays County, there is an excellent exposure of the Cow Creek beds. These beds are approximately

forty-five feet thick in this locality, and are very fossiliferous. The following fossils were collected from this locality: Dufrenoya justinae (Hill), Cucullaea terminalis (Conrad), Trigonia concentrica (Cragin), two other species of Trigonia identical with the species of the previous sections of the Cow Creek beds, three undescribed species of Homomya different from the species at the Hammett's crossing section of the Cow Creek beds, and an undescribed species of Astrocoenia.

One mile west of Cox's Crossing on the Pedernalis River, Burnet County, the following fossils were collected by Professor F.L. Whitney from the Cow Creek beds: Three undescribed species of Natica, and undescribed species of Aporrhais, an undescribed species of Astrocoenia similar to the one from Dead Man's Hole, Dufrenoya justinae (Hill).

In Comal County the base of the Travis Peak formation is not exposed, but there are some good exposures of the upper portion. The following two incomplete sections measured by Professor F.L. Whitney will give an idea of the character of the formation as exposed in Comal County:

Section at Speck's Crossing on the Guadalupe River

	Feet
Travis Peak formation:	
2. Yellow "pack-sand", barren of fossils	36
1. Arenaceous limestone, fossils similar to those found at type section in the Cow Creek beds	78

Section at Rebecca Creek, Comal County.

Glen Rose formation.	
Travis Peak formation:	
2. Yellow "pack-sand" and calcareous sand containing an abundance of geodes and large undescribed Ostrea	45
1. Arenaceous limestone, fossils similar to those found at type section in the Cow Creek beds, approximately	80

The Travis Peak formation above the Cow Creek beds is barren of fossils except in one locality discovered by Professor F.L. Whitney. Near Rebecca Creek, Comal County, thirty feet from the top of the formation an undescribed species of Ostrea different from the Ostrea of the type section and an undeterminable species of Trigonia are found. At no other locality have these forms been found.

Of the thirty-six species of fossils listed from the Travis Peak formation, thirty-four are found in the Cow Creek beds and two from the upper-

most beds of the formation. Seven of the species belonging to the Travis Peak formation have been described, the other twenty-nine are new species, and will be described by the writer in a later paper. The described species are: Cucullaea terminalis (Conrad), Cardium (Protocardia) texanum (Conrad), Trigonia concentrica (Cragin), Exogyra weatherfordensis (Cragin), Chione (?) decepta (Hill), Dufrenoya justinae (Hill), Gryphaea wardi (Hill and Vaughan).

All of these species, with the possible exception of Dufrenoya justinae (Hill) and Chione (?) decepta(Hill), are common to both the Travis Peak and Glen Rose formations. It is highly probably that the majority of the undescribed species from the Travis Peak are also present in the Glen Rose formation.

There are several noteworthy faunal differences between the Glen Rose and Travis Peak formations. No Foraminifera have been found in the lower formation; there are, however, several prominent horizons of Orbitolina in the Glen Rose formation. According to Professor F.L. Whitney, there are at

least four different genera of Brachiopoda in the Glen Rose, but none are known from the Travis Peak. No representatives of the echinoderms are known from the lower formation, though Crinoids and Echinoids are present in the Glen Rose. Of the Pelecypoda the Monopleuridae, Caprinidae, and Rudistae are well represented and constitute conspicuous horizon markers in the upper formation, but are absent from the Travis Peak.

Incident to the difficulties encountered in any attempt at separating the Glen Rose and Travis Peak formations, the importance of the above faunal differences can not be overemphasized.

R.T. Hill[6] begins the Glen Rose formation with the first occurrence of the fossils Requienia (Caprotina) and Monopleura. This is, however, a more or less arbitrary basis upon which to separate the Travis Peak from the Glen Rose formation. The chief difficulty in using the Monopleura and Requienia forms as indicative of the beginning of the Glen Rose formation is that these forms are not always found at the base of the formation. In

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6 Ibid, p. 144.

the vicinity of the type section of the Travis Peak formation these forms are generally, but not always present in the base of the Glen Rose. At one locality near the Travis Peak post-office Porocystis globularis (Giebel), a Glen Rose fossil, is found below the first occurrence of the Monopleura and Requienia forms. In parts of Comal and Hays Counties an undescribed species of Astrocoenia discovered by Professor F.L. Whitney appears in abundance at the base of the Glen Rose formation. In many localities the base of the Glen Rose is barren of fossils. Incident to the similarity of the lithology of the top of the Travis Peak and the base of the Glen Rose formations, and to the lack of sufficient faunal evidence, the arbitrary contact established by Hill seems to be of little importance. Doubt exists as to the advisability of separating the two formations; it is highly probable that the two formations are in reality only two divisions of one major formation. In any event the contacts of the two formations as now known are far from being

satisfactory.

[7]In Gillespie County, Hill has given the term "Gillespie formation" to the basement beds of the Cretaceous. The following is a section, measured with an aneroid by Professor Whitney nineteen miles north-west of Fredericksburg at the Fredericksburg and Mason County line:

	Feet
Comanche Peak and Walnut formations:	
3. Clays, sands, and calcareous sandstone containing Walnut and Comanche Peak fossils	50
Glen Rose formation:	
2. Sandy limestone, white to yellow	45
Gillespie formation:	
1. Cross-bedded brown to brownish red sands with pyritiferous concretions	100

The Cretaceous sediments at this locality rest unconformably upon the Hickory formation, (Upper Cambrian). This area was relatively high during Cretaceous deposition, and received very little of the Cretaceous sediments. Further north

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[7] Hill, R.T. and Vaughan, T.W.: "Geology of the Edwards Plateau and Rio Grande Plain adjacent to Austin and San Antonio, Texas," Eighteenth Annual Report, U.S. Geol. Survey, 1898, p.221.

and west around the old Llano uplift none of the Cretaceous sediments are represented. Hill[8] is of the opinion that the so-called Gillespie formation is probably equivalent to the Glen Rose rather than the Travis Peak. There are no fossils present, but the lithology seems to indicate that the Gillespie formation is the equivalent of the Hensell sand of the upper Travis Peak. The limestone above the Gillespie resembles some limestone seen in the basal Glen Rose farther east. At the town of Fredericksburg the vari-colored sands and clays, undoubtedly belonging to the Travis Peak formation, are approximately one hundred and seventy-five feet thick according to aneroid measurements. The Glen Rose and Travis Peak formations thicken rapidly to the east and southwest of Fredericksburg.

[9]In Europe and most other parts of the earth the Cretaceous has been subdivided generally into two great groups: Infracretaceous and Supracretaceous. These have been further subdivided in the

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[8] Ibid, p.222.

[9] Böse, E. and Cavins, O.A.: "The Cretaceous and Tertiary of Southern Texas and Northern Mexico," Univ. of Texas Bull. 2748, 1927, p.12.

the following way:

Maestrichtian		Supracretaceous
Campanian		
Santonian		
Coniacian or Emscherian		
Turonian		
Cenomanian		
Albian		Infracretaceous
Aptian		
Barremian	Neocomian	
Hauterivian		
Valanginian		
Berriasian		

R.T. Hill[10] attempts to correlate the whole of the Trinity division with the Neocomian of Europe on the basis of the similarity of some few bivalves and univalves of the Glen Rose formation to some of the European Neocomian forms. Hill correlates the lower Trinity with the lowest Cretaceous of Europe, and the middle and upper Glen Rose beds are correlated with the middle and upper Neocomian.

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[10] Hill, R.T.: "Invertebrate Paleontology of the Trinity Division," Proc. Biol. Soc. Washington, Vol.8, 1893, pp. 17-20.

It is a generally conceded fact that the lowest Cretaceous of Mexico is much older than the lowest Cretaceous of Texas. The lower Cretaceous sea passed into Texas from Mexico moving up a gently sloping land surface, and as the sea passed interiorward through Texas the deposits became younger and younger in age.

[11]The entire Neocomian division is represented in Mexico. Incident to this fact it is, therefore, obvious that the lowest Cretaceous in Texas could not possibly be equivalent to the lowest Neocomian. An interesting fact in this connection is that none of the Neocomian fossils of Mexico have been found in Texas, either in the Travis Peak or Glen Rose formations.

[12]Böse and Cavins correlate the Travis Peak formation with the Gargasian (Upper Aptian), on the basis of the supposed occurrence of Dufrenoya texana (Burckhardt), D. justinae (Hill), D. roemeri (Cragin), and D. hoplitoides (Lasswitz) in the Travis Peak beds. Of the four species D. jus-

11 Böse, E. and Cavins, O.A.: "The Cretaceous and Tertiary of Southern Texas and Northern Mexico," Univ. of Texas Bull., 2748, 1927, pp.17-18.

12 Ibid, pp.20-21.

tinae is the only one that undoubtedly came from the Travis Peak formation. The rest of them might very well be Glen Rose forms. Species of Dufrenoya appear to be present in the Glen Rose formation.

Nowhere has the writer seen any species of Dufrenoya other than D. justinae in the Travis Peak formation. Incident to the difficulty of separating the two formations in the field, it is entirely possible that the other three species came from the Glen Rose formation. In any event, the possibility of correlating the Travis Peak with the Upper Aptian on the basis of Dufrenoya alone is extremely doubtful. [13]None of the other fossils cited by Böse and Cavins as coming from the Aptian of Mexico are found in the Travis Peak formation.

It is significant that Hill correlates the Travis Peak with the lowest Neocomian while Böse and Cavins correlate it with the Upper Aptian. It will be impossible accurately to correlate the Travis Peak formation with European and Mexican

[13] Ibid, pp. 19-20.

Cretaceous until further work has been done with the fauna of the Trinity formations. At the present time it is the opinion of the writer that the Travis Peak represents a part of the Aptian, probably the Bedoulian,or Lower Aptian. The three species of Natica cited from the Cow Creek beds of the Travis Peak formation are similar to, if not identical with species of Natica from the Lower Aptian of Spain. The species of Aporrhais, Pholadomya, Gervillia, and Astrocoenia of the Cow Creek beds resemble Aptian forms more nearly than they do Neocomian forms.

The topography of the Travis Peak formation is represented for the most part by a rolling, wooded surface. Small buttes and mesas, low hills and escarpments, and small valleys are among the topographic features of this formation. Caves, caverns, and sink holes are among its characteristic features. Hamilton's Pool, Curiosity Cavern, West Cave, and Dead Man's Hole in Travis and Hays counties are beautiful examples of the varied topographic features of this formation.

Stalactites, stalagmites, and travertine depos-

its are common in the caves and caverns and on the cliffs. Geodes from two to nine inches in diameter composed of calcareous and siliceous materials are found in great abundance scattered over the surface of the ground thirty feet from the top of the formation in the vicinity of Rebecca Creek, Comal County. Arenaceous and pyritiferous concretions, calcite, celestite, and some lignitic materials are found throughout the formation.

Up to the present time no minerals of commercial value have been found in the formation. It is entirely possible, however, that oil will be encountered in some of the more porous sandy phases of the formation. This formation is the most prolific water producing formation in the Texas Cretaceous. Springs and artesian wells are encountered throughout the entire extent of the Travis Peak. The upper sands are productive of large amounts of potable water, but often contain enough magnesium sulfate ($MgSO_4$) to render the water undesirable for drinking purposes. The lower or Sycamore sands produce the greatest amount of artesian water. The water from the sands is highly potable, and consti-

tutes the chief source of the water supply for many people living on or within drilling reach of the Travis Peak formation.

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