THE WASHITA GROUP IN THE VALLEY OF THE TRINITY RIVER, TEXAS

A Guide for the 1955 Field Excursion

Sponsored by the

DALLAS GEOLOGICAL SOCIETY AND SOUTHERN METHODIST UNIVERSITY
DEPARTMENT OF GEOLOGY

BOB F. PERKINS
and
CLAUDE C. ALBRITTON, JR.

FONDREN SCIENCE SERIES: 5

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SOUTHERN METHODIST UNIVERSITY PRESS
DALLAS

The Washita Group in the Valley of the Trinity River, Texas

BY BOB F. PERKINS* AND CLAUDE C. ALBRITTON, JR.†

INTRODUCTION

Our present understanding of Washita biostratigraphy in the north Texas area is founded upon the pioneer work of W. S. Adkins, W. M. Winton and Gayle Scott. Their work was published from about 1919 to 1932, and as is inevitable many of the outcrops studied by them are no longer accessible and several new exposures have added to our knowledge of the local biostratigraphy.

It is the purpose of this field guide to acquaint geologists with those localities which are now accessible and which typify Washita stratigraphy in Tarrant and southern Denton counties.

The authors wish to express their gratitude to Messers Joseph Jeffers and Joseph Kenny, graduate students in geology at Southern Methodist University, for the field and laboratory assistance they rendered in preparation of the measured sections. Thanks are also due the various geology students at Southern Methodist University who prepared the graphic sections. The authors also wish to express their gratitude to Professors S. W. Geiser and James E. Brooks for reading the manuscript and offering many helpful suggestions.

The following members of the Dallas Geological Society have been responsible for the arrangements for the Dallas Geological Society-Southern Methodist University 1955 Spring Field Excursion for which this guidebook has been prepared:

GEORGE H. NORTON, *Atlantic Refining Company*
DAN E. BOONE, *Scott Hammonds*
H. C. BRAND, *Schlumberger Well Surveying Corporation*
JOSEPH NEELY, *Magnolia Petroleum Company*

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ROAD LOG

Mileage	
0.0	Starting point on Texas Highway 114, 0.2 mile northwest of the intersection of Texas 114, Texas 183, U.S. 77, and Loop 12, Dallas, Texas.
2.20	Overpass of Santa Fe Railroad.
3.05	Bridge over Elm Fork of the Trinity River.
9.30	WBAP-WFAA transmitter station.
11.50	Intersection with Loop 10. Continue on 114.
11.75	Overpass of St. Louis-Southwestern Railroad.
12.10	Grapevine city limit. Continue on 114.
12.85	Intersection with Texas 121. Continue on 114.
14.95	Intersection with Farm Road 1709. Continue on 114.
22.45	Roanoke city limit.
22.75	Intersection with U.S. 377. Turn left onto 377.
22.90	Turn right on 377.
22.95	Turn right on 377.
23.10	Overpass of Texas 114.
25.85	Bridge over Denton Creek.
26.80	Take sharp right turn onto old Denton highway.
27.25	Road block on old Denton highway. Turn left onto gravel road.
28.25	Grayson Bluff visible to the right ahead as grey bluff.
28.55	Narrow bridge over creek.
28.80	Turn right onto well marked track along base of hill to the left.

Mileage

29.20 STOP in the meadow southwest of the grey bluff.

LOCALITY 1 — GRAYSON BLUFF.

Return to gravel road.

29.60 Turn left onto gravel road.

29.85 Narrow bridge over creek.

30.05 STOP along the right side of the road.

LOCALITY 2 — ROAD CUT WEST OF GRAYSON BLUFF.

Continue westward on gravel road.

30.95 Road bends right.

31.20 Road bends left to join pavement.

31.70 Intersection with U.S. 377. Turn left.

32.40 Quaternary gravels on left of road.

32.65 Bridge over Denton Creek. Weno limestone exposed in creek bed to left of road.

34.68 Main Street limestone exposed in road cuts.

35.65 Roanoke city limit.

35.70 Overpass of Texas 114.

35.85 Intersection with Texas 114. Continue on 377.

36.00 Railroad crossing.

37.05 Denton-Tarrant county line.

40.65 Keller city limit.

41.20 Intersection with Texas Farm Road 1709. Continue on 377.

41.60 Grayson marl exposed in creek to left of road.

46.45 Watauga city limit.

46.55 Turn left onto paved road.

48.10 Crossroad; pavement ends. Continue straight ahead.

49.15 Crossing of St. Louis-Southwestern Railroad.

Mileage	
49.40	Smithfield city limit.
49.50	Woodbine formation exposed on right.
49.70	Turn right onto paved road.
51.60	Intersection with Texas 121. Turn left across 121 and continue on same road as before.
53.30	Turn right onto unpaved road.
54.00	Intersection with paved road. Continue on gravel road.
55.05	Intersection with Texas 183. Continue on gravel road.
55.20	Crossing of Rock Island and Pacific Railroad.
55.30	Railroad crossing.
55.60	Bridge over creek.
56.05	Entrance to Fort Worth Gravel Company on left.
57.25	Bridge over West Fork of Trinity River.
57.40	Intersection. Turn right.
59.65	Main Street limestone exposed in roadside gulley to left.
59.70	Turn left onto Handley Drive.
61.10	Road bends right.
61.15	Road bends left.
61.50	Road bends right.
61.60	Road bends left.
62.20	Intersection with Meadowbrook Drive; Fort Worth city limit. Continue on Handley Drive.
63.20	Intersection with East Lancaster Avenue (U.S. 180). Turn right onto highway.
63.35	Turn half-left onto Haynie Street.
63.65	Turn left onto Craven Road.
63.70	Crossing of Texas and Pacific Railroad.
65.65	Turn right.
65.70	Turn left.

Mileage

66.30 Turn right onto Bowman Springs (Polly Webb) Road.

68.40 Jog left onto Collin Street.

69.05 Turn left onto Shackleford Street.

69.08 Turn right onto Collin Street.

69.45 Turn left onto Foard Street.

69.48 Turn right onto Collin Street.

69.60 Turn left onto Wichita Street.

70.55 Turn right onto Seminary Drive.

70.75 Intersection with Mansfield Road. Continue on Seminary Drive.

71.00 Intersection with Horton Road. Continue on Seminary Drive.

71.15 Crossing of Texas and New Orleans Railroad.

71.90 STOP along right side of the road.

LOCALITY 3 — SEMINARY DRIVE AND SYCAMORE CREEK.

Turn around and follow Seminary Drive back to Horton Road.

72.70 Crossing of Texas and New Orleans Railroad.

72.80 Turn left onto Horton Road.

73.10 Turn left onto Mansfield Road.

73.55 Divided roadway begins.

73.70 Main Street limestone exposed on left of road.

74.20 Weno limestone exposed on right of road.

74.60 Bridge over Sycamore Creek.

74.85 Intersection with Berry Street. Continue on Mansfield Road (Riverside Drive).

75.20 Turn right onto Glen Garden Drive.

75.35 Turn left into Cobb Park. Follow main road through park along west side of Sycamore Creek.

76.25 Road divides. Follow right fork.

Mileage

76.40 Dry weather crossing of Sycamore Creek. Note bluff of Denton shale to right about fifty yards.

76.45 Turn left.

76.60 Turn left off road into meadow.

76.65 STOP in meadow along the creek.

LOCALITY 4 — COBB PARK.

Return to pavement.

76.70 Turn left onto pavement.

76.85 Turn left onto Maddox Avenue.

76.88 Bridge over Sycamore Creek.

77.45 Turn left onto S. Riverside Drive.

79.00 Turn right onto Berry Street.

79.40 Crossing of International and Great Northern Railroad.

80.00 Turn left onto North-South Freeway.

83.00 Bridge over Sycamore Creek.

85.20 Turn right onto gravel road.

85.75 Main Street limestone exposed along road.

85.95 Crossing of Missouri-Kansas-Texas Railroad.

86.85 Turn left onto Crowley Road (Farm Road 731).

87.65 Turn left into driveway. Follow road north of house and turn left through gate into meadow.

87.90 STOP in meadow along the creek.

LOCALITY 5 — SYCAMORE CREEK AND CROWLEY ROAD.

Return to Crowley Road.

88.20 Turn left onto Crowley Road.

88.70 Road bends right.

89.00 Road bends left.

90.60 Crowley city limits.

Mileage

91.00 Note exposure of Main Street limestone in bluff along Village Creek to the left of the road.

91.70 Turn right onto Precinct Road 1018.

91.85 Crossing of Santa Fe Railroad.

92.05 Turn left onto Precinct Road 1037.

92.20 Road bends right.

92.40 Road bends left.

92.55 Road bends right.

93.40 Road bends left.

93.90 Road bends right.

95.90 Turn right onto Precinct Road 1035.

96.10 Turn left onto Precinct Road 1037.

96.50 Road bends left.

96.60 Road bends right.

97.20 Intersection with Precinct Road 1089. Continue on 1037.

97.70 Road bends right.

97.85 Road bends left.

98.50 Road bends right.

98.55 Road bends left.

98.65 Bridge over Rocky Creek. Note exposure of lower limestone member of Duck Creek formation and upper Kiamichi formation in creek bed to right.

99.45 Turn left through gate on the east side of the Santa Fe Railroad. Drive southward along the railroad right-of-way.

100.15 STOP along the railroad.

LOCALITY 6 — CUTS OF THE SANTA FE RAILROAD.

Return to gravel road.

100.85 Turn right onto gravel road.

101.60 Bridge over Rocky Creek.

Mileage

101.70 Road bends right.

101.75 Road bends left.

102.40 Road bends right.

102.55 Road bends left.

103.05 Turn left onto Precinct Road 1089.

103.60 Bridge.

103.75 Bridge.

104.60 Turn left through gate into pasture of F. P. Feltz Ranch. Follow well-traveled road through pasture.

104.95 Deep gulley to right of road.

105.31 Go through gate and follow less-traveled track to right.

105.90 Go through gate and turn left along fence. Follow road to railroad.

106.20 STOP. Park car and walk south through gate to Rocky Creek. Then walk west along the road on the north side of the creek and when on west side of trestle cross creek and follow road south to quarry beside railroad.

LOCALITY 7 — FELTZ RANCH QUARRY.

Retrace route to Precinct Road 1089.

106.50 Go through gate and turn right.

107.09 Go through gate.

107.45 Deep gulley to left of road.

107.80 Turn right onto Precinct Road 1089.

108.65 Bridge.

108.80 Bridge.

109.35 Turn right onto Precinct Road 1037.

109.85 Road bends right.

110.00 Road bends left.

110.65 Road bends right.

110.70 Road bends left.

Mileage	
110.80	Bridge over Rocky Creek.
111.60	Crossing of Santa Fe Railroad.
112.30	Road bends right.
112.75	Road bends left.
113.50	Dry weather crossing of Mustang Creek. Goodland limestone in creek bed to right of road.
113.70	Turn right.
114.90	Road bends left.
115.85	Road bends right.
116.45	Road bends left.
116.55	Road bends left.
117.00	Goodland limestone exposed to left of road.
117.20	Road bends right.
117.45	Bridge over creek.
117.55	Road bends right.
117.65	Road bends left.
118.55	Road bends right.
118.75	Road bends right.
119.30	Turn left following main road.
119.95	Road bends right.
120.35	Turn right onto U.S. 377.
120.90	Bridge over Clear Fork of Trinity River. Large ripple marks in Goodland limestone exposed in stream bed to right of road.
121.25	Goodland limestone in road cut.
122.15	Kiamichi formation in slopes to left of highway.
122.55	Duck Creek limestone in road cuts.
125.35	Benbrook city limit.
125.65	Goodland limestone exposed along road.

Mileage	
126.00	Kiamichi formation to left of road.
127.60	Overpass for Texas and Pacific Railroad.
129.65	Divided highway begins.
129.80	Fort Worth city limit.
130.20	Traffic circle.

DESCRIPTION OF LOCALITIES

LOCALITY 1: GRAYSON BLUFF

Figure 1.

Exposed at this locality are the basal beds of the Woodbine formation, an eroded remnant of the Buda limestone, the Grayson marl, and the upper beds of the Main Street limestone. A complete section of the Grayson marl is exposed in the southwestward-facing bluff, beneath a cap of Woodbine sand. Joint blocks of Buda limestone are strewn around the crest of the hill; and in a road cut about 100 yards north of the bluff the Buda may be seen resting on the Grayson and beneath purplish Woodbine sand. The Main Street limestone forms the low benches southwest of Grayson Bluff.

BUDA LIMESTONE. The Buda limestone was first named by T. W. Vaughan (1900, p. 18) from exposures of a fragmental limestone about 100 feet thick, on Shoal Creek at Austin, Texas. The formation thins northward from the type area, and north of central Bell County it occurs intermittently as inliers, as for example at Grayson Bluff. Here the Buda is a clastic, coquinitic limestone about eighteen inches thick. The contact with the Woodbine above is along an irregular surface of erosion, while the contact with the underlying Grayson is apparently conformable. Stephenson (1944, p. 1538) has reported several fossils from this locality which are characteristic of the Buda limestone farther to the south. The large oyster, *Exogyra whitneyi* and the ammonite *Budaiceras* are fairly common.

GRAYSON MARL. The Grayson marl was named by F. W. Cragin in 1894 (pp. 43-48) for exposures of a yellow to grey, calcareous, fossiliferous marl in Grayson County, Texas. In the type area, the formation is about 25 feet thick and consists of gray marl with thin nodular limestone bands. At Grayson Bluff the formation is about 80 feet thick as measured by Albritton *et al.* (1954, p. 331) and consists of four units: a lower marl (18 feet thick), a lower clay (24 feet thick), an upper marl with interbedded marly limestone (21 feet thick) and an upper clay (15 feet thick). The Grayson marl is very fossiliferous, with various species of pelecypods dominating the megafauna. In the basal ten feet of the lower marl there are large numbers of the ram's horn oyster, *Exogyra arietina,* and in the upper part of this unit there are scattered individuals of *Gryphaea graysonana.* Although megafossils are rare in the lower clay, *Plicatula* occurs at several levels. The highly fossiliferous upper marl contains the pelecypods *Pecten texanus, Gryphaea graysonana* and *Plicatula,* the echinoids *Holectypus castelloi* and *Enallaster texanus,* various gastropods, and a few ammonites. The upper clay is less fossiliferous than the underlying unit, but *Plicatula* is common and *Exogyra drakei* is occasionally found.

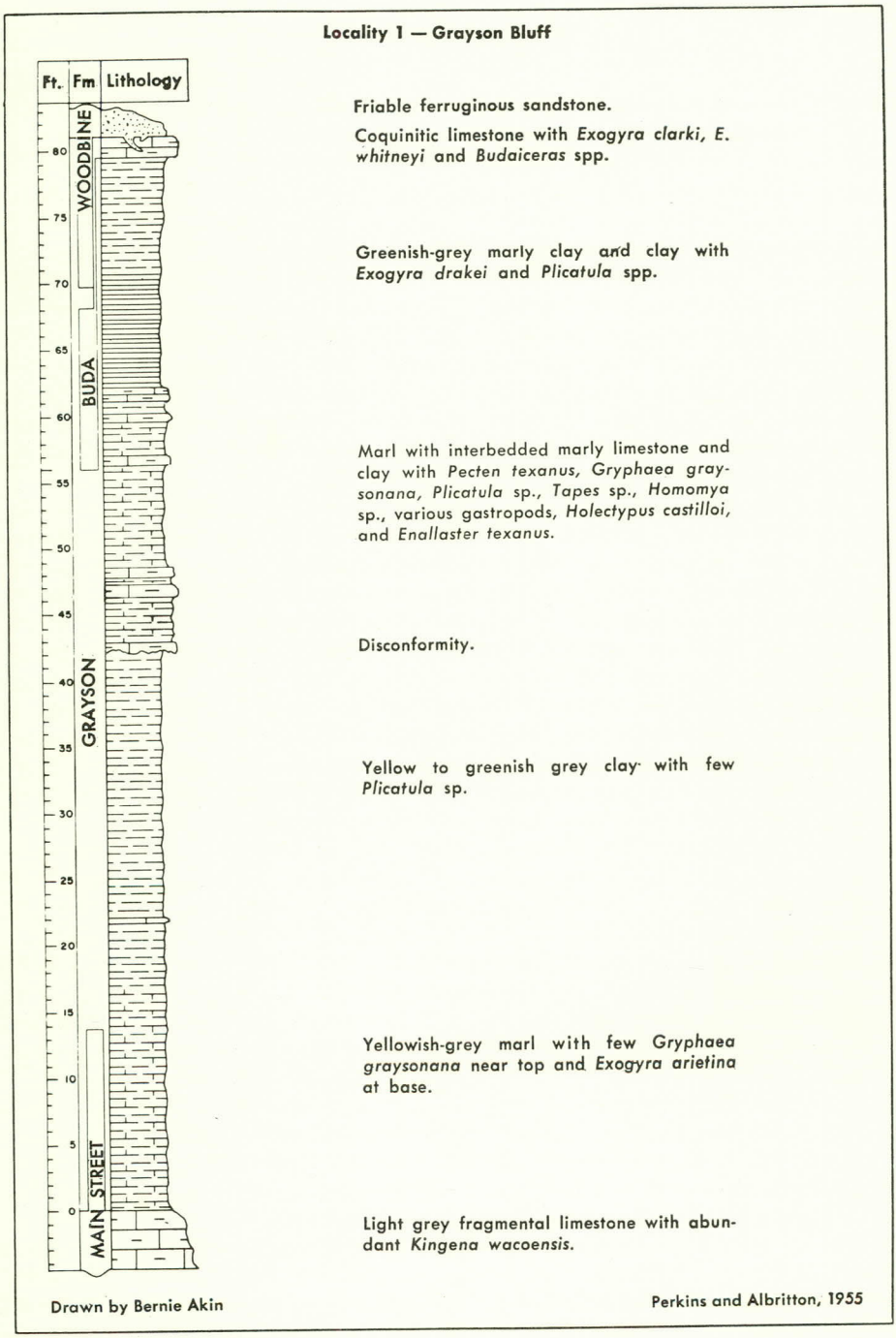

Figure 1. Graphic section of Grayson Bluff locality northeast of Roanoke, Denton County, Texas.

MAIN STREET LIMESTONE. The Main Street limestone was named by Robert T. Hill (1894, pp. 302, 303, 317, 328-331) for exposures of a fossiliferous coarse-grained limestone on East Main Street in Denison, Grayson County, Texas. The Main Street limestone is about ten feet thick in the type area, but in southern Denton County it thickens to nearly 20 feet. The upper ten feet is poorly exposed in low benches south of Grayson Bluff. The hard, light gray fragmental limestone here is characterized by an abundance of the brachiopod *Kingena wacoensis*.

LOCALITY 2: ROAD CUT WEST OF GRAYSON BLUFF

Figure 2.

Along the south side of the road leading west from Grayson Bluff is a very good exposure of the contact between the Grayson marl and the Main Street limestone.

GRAYSON MARL. At this locality the basal six feet of the Grayson rests conformably on the Main Street limestone. The Grayson consists mostly of yellowish-gray marl, with interbedded marly limestone, and with a hard clastic limestone layer about three feet above the base. The little oyster, *Exogyra arietina*, is abundant.

MAIN STREET LIMESTONE. The upper six feet of the Main Street limestone as exposed here consists of a hard, light grey limestone that is obscurely bedded in units that range from ½ to 2½ feet thick, separated by marl seams ranging up to six inches thick. The limestone is fragmental throughout and contains broken and entire shells of pelecypods (*Pecten* and *Exogyra*) and brachiopods (*Kingena wacoensis*), the latter being particularly abundant in the upper three feet.

LOCALITY 3: SEMINARY DRIVE AND SYCAMORE CREEK

Figure 3.

A middle Washita section consisting of (in descending order) the lower Main Street limestone, the Pawpaw shale, the Weno formation, and the upper Denton marl is exposed along a cuesta and bordering slopes leading down to Sycamore Creek.

The lower part of the Main Street limestone and the entire section of Pawpaw shale are exposed in the roadcut at the top of the cuesta and in the deep roadside gulley; the lower Pawpaw beds are exposed in the low brownish knobs about 100 yards south of the road; the upper 30 feet of the Weno formation is exposed in a gulley about 300 yards south of the road; and the basal five feet of the Weno formation together with the upper five feet of the Denton marl are exposed in the bed of Sycamore Creek south and north of the road.

MAIN STREET LIMESTONE. In this part of Tarrant County the Main Street limestone is about 32 feet thick. The lower 20 feet, as exposed

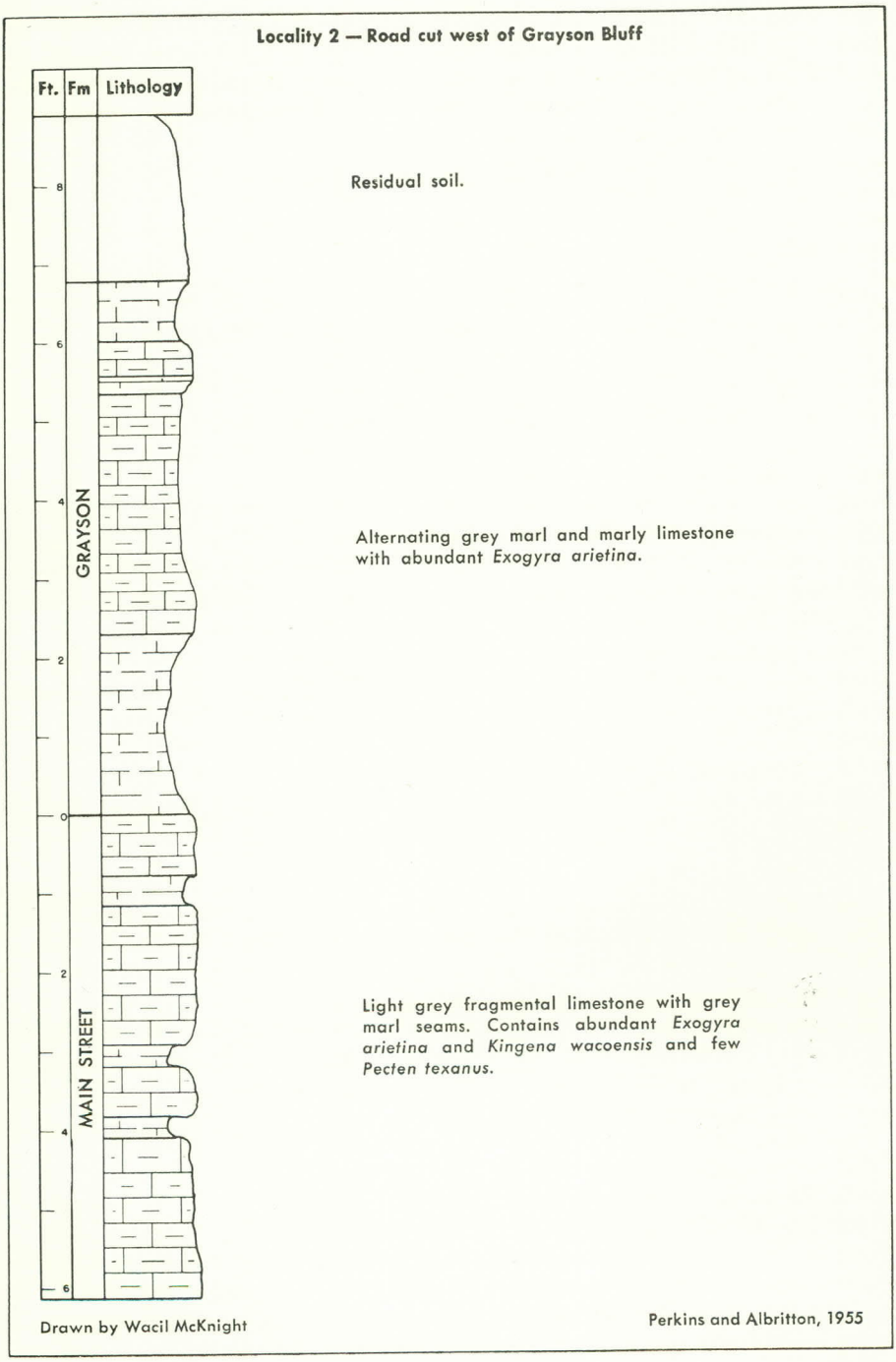

Figure 2. Graphic section of roadcut west of Grayson Bluff, Denton County, Texas.

at this locality, consists of hard, fragmental limestone units one-half to two feet thick, separated by marl units one inch to two feet thick. The marl beds are thickest and most numerous in the lower eight feet of the formation. The Main Street rests with apparent conformity on the gray Pawpaw shale.

The nautiloid cephalopods *Cymatoceras hilli* and C. *texana* and the large clam *Pachymya austinensis* are fairly common and the echinoid *Holectypus castellio* and the pelecypods *Pholadomya shattucki* and *Ostrea* sp. are occasionally found.

PAWPAW SHALE. The Pawpaw shale was named by Robert T. Hill in 1894 (p. 303) for exposures of a 55 foot ferruginous sand and clay sequence found along Pawpaw Creek in northeast Denison, Grayson County, Texas. Southward from the type locality, the formation thins and becomes less sandy and more clayey and calcareous. In the Tarrant County area the formation is a dark grey to bronze shale, with a few paper-thin sandstone partings and several ironstone layers. Here the formation is 17 feet thick. In the upper three feet the large foraminifer *Haplostiche texana* and the cat's paw pelecypod, *Plicatula* occur in large numbers. South of the road in the low brownish knobs, where the lower Pawpaw is exposed, there is a dwarfed "pyrite" fauna of ammonites, pelecypods, corals, and gastropods.

WENO FORMATION. The Weno formation was named by Robert T. Hill in 1901 (pp. 121, 247, 269-280) for exposures of ferruginous clay, marl and limestone near Weno, Grayson County, Texas. In the type area the Weno is principally of clay, and is about 117 feet thick. It thins southward to about 50 feet in Tarrant County and is represented here mostly by grey marl, with several thick limestone beds in the uppermost and lowermost parts.

At this locality the upper limestone sequence is 19 feet thick, the middle marl 20 feet thick and the lower limestone series 6 feet thick. The nautiloid *Cymatoceras,* the ammonite *Pervinquieria wintoni* and the pelecypod *Ostrea carinata* are abundant in the upper limestone beds. In the middle marl *Haplostiche texana* occurs about 20 feet from the top of the formation, and the razor clam *Gervilliopsis invaginata* occurs about 18 feet lower. In the lower marl and limestone sequence the characteristic fossils are the pelecypod *Pecten georgetownensis,* the gastropod *Turritella ventrivoluta* and other pelecypods and gastropods.

DENTON MARL. The Denton marl was named by J. A. Taff in 1893 (p. 272) for exposures of a gray marl on Denton Creek near Justin, Denton County, Texas. At the type locality the formation is about 35 feet thick, as it is also in Tarrant County. Only the upper five feet of the formation is exposed here. This part of the formation is almost entirely a shell conglomerate of *Gryphaea washitaensis,* the matrix being a grey marl. In addition to *G. washitaensis* the conglomerate contains a few *Ostrea carinata,* but other species are very rare.

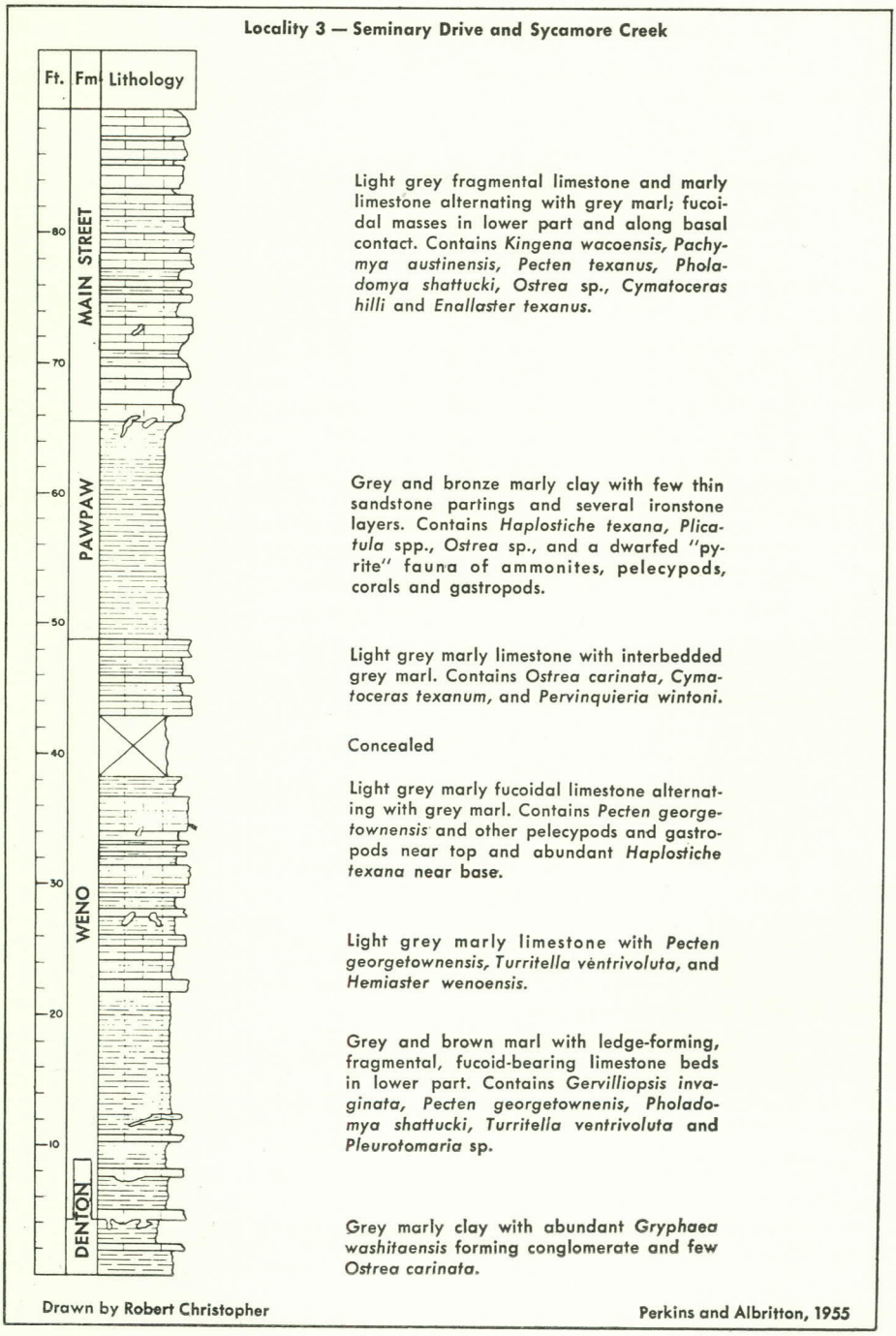

Figure 3. Graphic section of Seminary Drive and Sycamore Creek locality, Fort Worth, Tarrant County, Texas.

LOCALITY 4: COBB PARK

Figure 4.

The basal beds of the Weno formation, an entire section of the Denton marl, and the upper few feet of the Fort Worth limestone are exposed in Cobb Park, about fifty yards south of the northernmost dry-weather crossing over Sycamore Creek. The upper fifteen feet of the Fort Worth limestone is exposed in the west bank of the creek fifty yards north of the dry weather crossing.

WENO FORMATION. The Weno is represented at this locality by two limestone beds, presumably the same as those in the bed of Sycamore Creek at the last locality visited. Fossils are not abundant, but occasional specimens of the gastropod *Turritella ventrivoluta* and the pelecypod *Pecten georgetownensis* are found.

DENTON MARL. A complete section of Denton marl is exposed in the bluff. The formation consists of about 35 feet of grey shale with several indistinct marly beds in the middle and near the base of the formation. The formation bears an apparently conformable relationship to the Weno formation above and the Fort Worth limestone below. With the exception of *Gryphaea washitaensis* shell beds in the upper five feet of the formation, the Denton marl is comparatively unfossiliferous. The middle and lower marl beds contain a sparse fauna of limonitized gastropods and pelecypods.

FORT WORTH LIMESTONE. The term Fort Worth limestone was originally used (Hill, 1889, pp. xiv, xxi, xxii) in reference to the Washita or Georgetown limestone, but Robert T. Hill in 1891 (p. 516) restricted the term to the regularly alternating limestone and marl sequence between the Duck Creek limestone and the Denton marl. The type exposures are in the bluff along the Trinity River north of the courthouse in Fort Worth, Tarrant County, Texas, and in various railroad cuts and quarries throughout the city. The formation is about 32 feet thick in Tarrant County, but exposures showing the complete section are rare.

In Cobb Park the formation consists of a fairly regularly alternating sequence of dense grey limestone beds, six to twelve inches thick, and grey marl seams a foot or less in thickness, the boundaries between the beds being somewhat gradational. Large masses of fucoids give some of the limestones a lumpy or indistinctly bedded appearance. The most common fossils are the ammonite *Pervinquieria leonensis,* the pelecypod *Pholadomya shattucki,* and *Ostrea* sp. Less common but equally characteristic of the Fort Worth limestone are the pelecypods *Pecten bellulus,* and P. *wrighti* and the echinoids *Hemiaster elegans* and *Holaster simplex.*

A more complete section of the Fort Worth limestone is exposed on the southwest and southeast sides of the intersection of Riverside and Lancaster drives about 1.5 miles north of Cobb Park. At this locality about 30 feet of the Fort Worth limestone is exposed, and the same regularly alternating sequence of limestone and marl persists to the base of the formation. (Figure 5.)

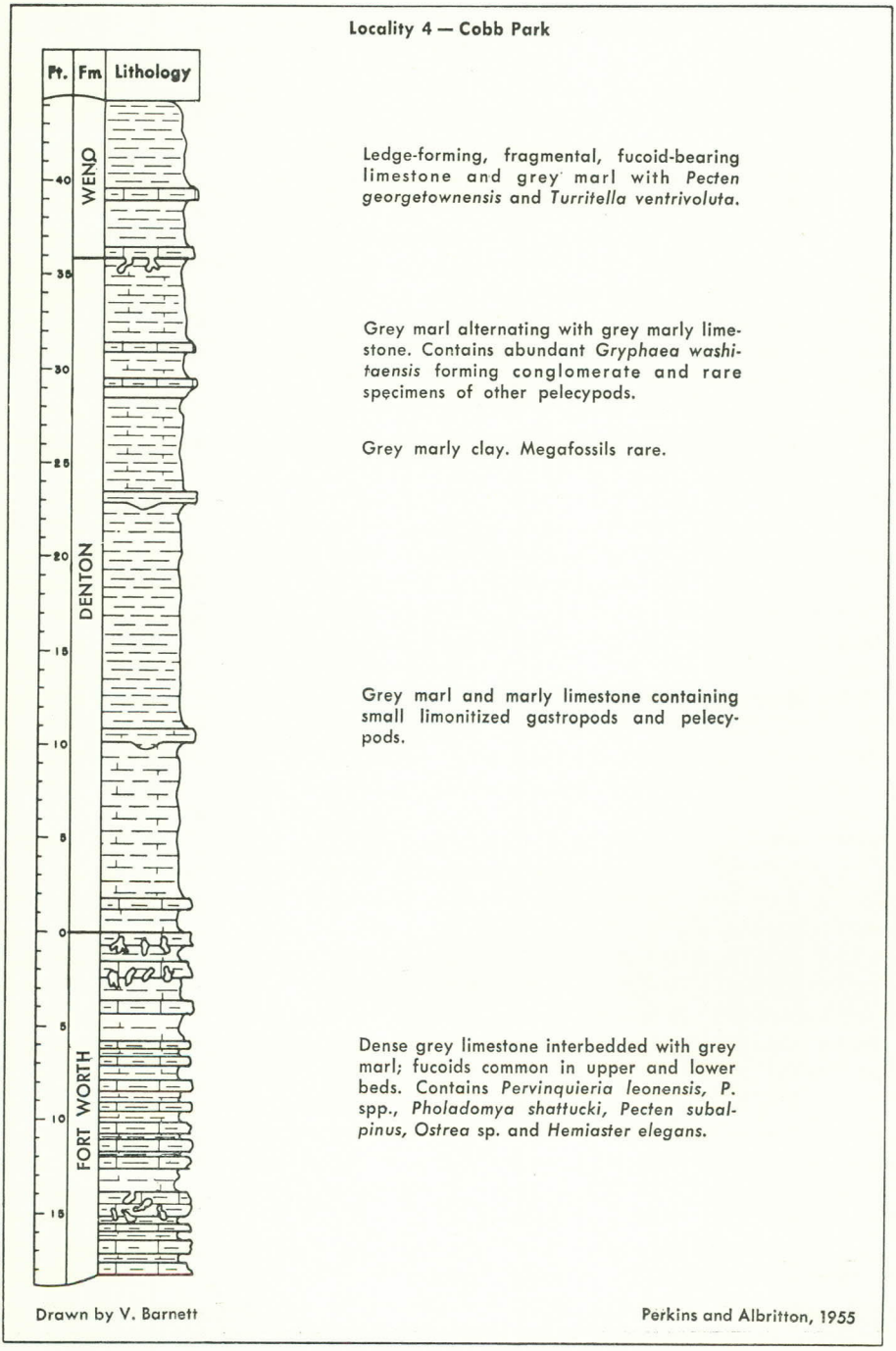

Figure 4. Graphic section of Cobb Park locality, Fort Worth, Tarrant County, Texas.

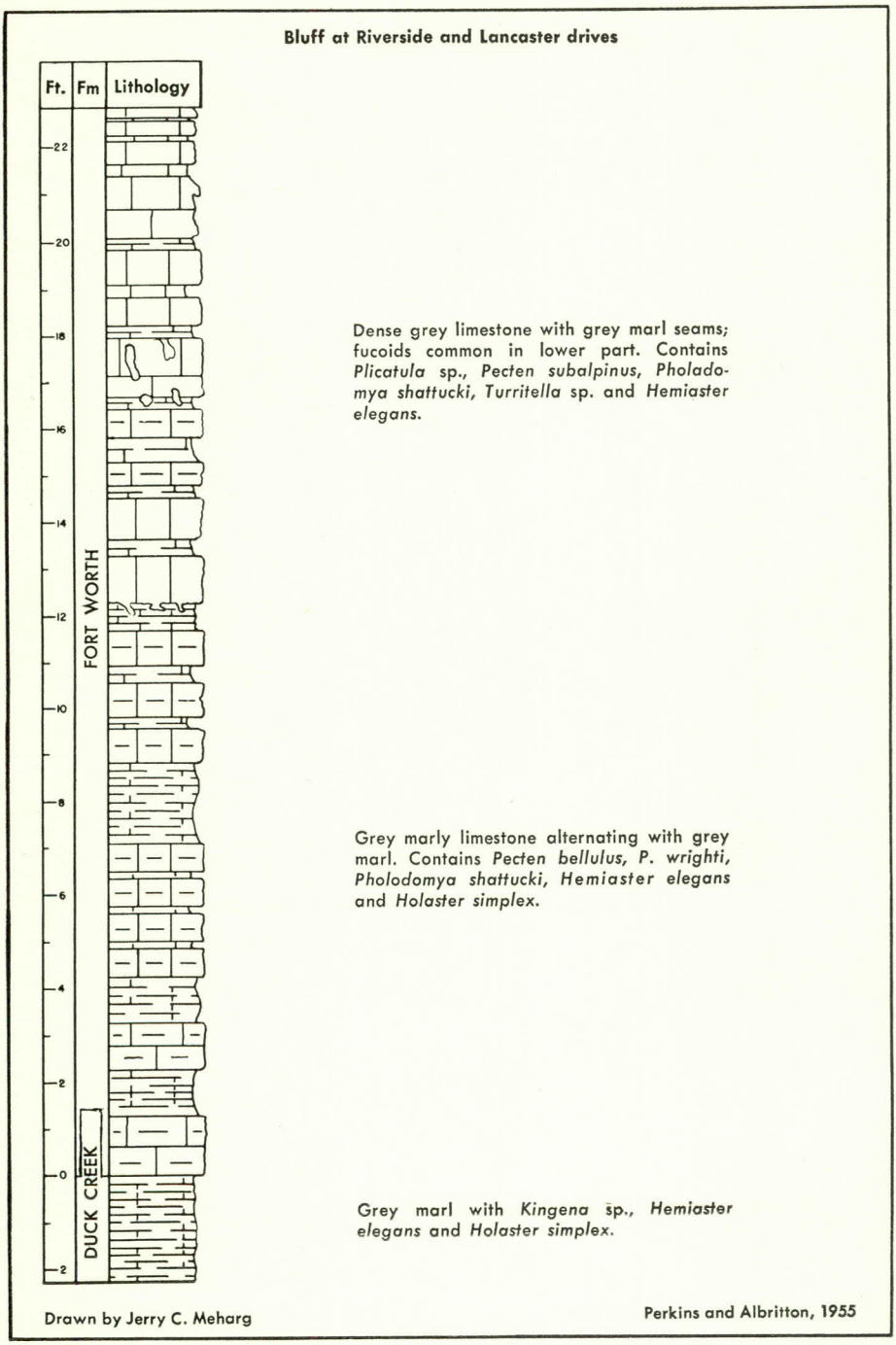

Figure 5. Graphic section of Fort Worth limestone at Riverside and Lancaster drives, Fort Worth, Tarrant County, Texas.

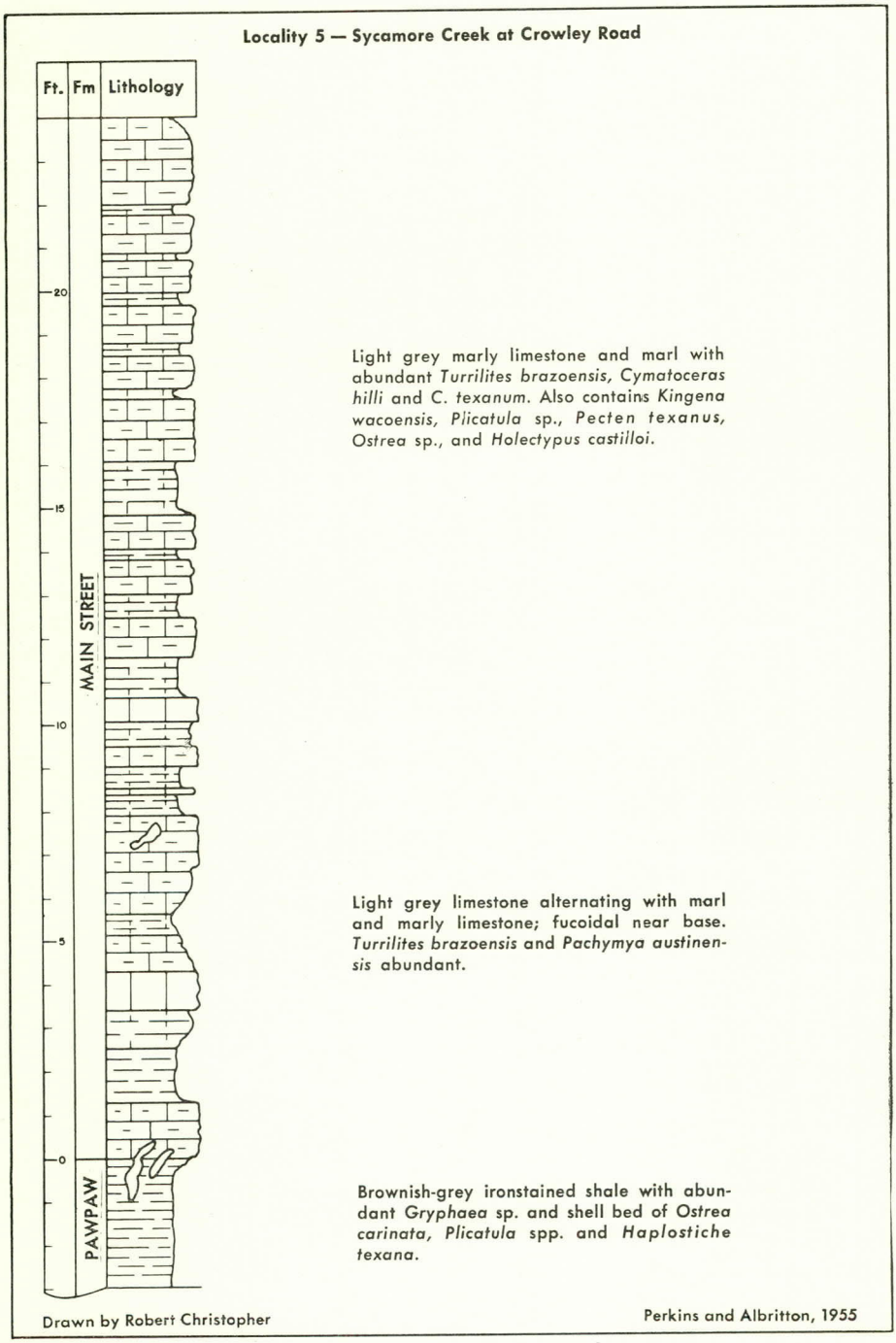

Figure 6. Graphic section of locality along Sycamore Creek east of Crowley Road, Tarrant County, Texas.

LOCALITY 5: SYCAMORE CREEK AT CROWLEY ROAD

Figure 6.

The lower Main Street limestone and the upper Pawpaw clay are exposed at this locality. The outcrop extends along Sycamore Creek from its intersection with the Crowley Road to a point about 200 yards downstream.

MAIN STREET LIMESTONE. The lower 20 feet of the Main Street as exposed here consists of hard, grey, indistinctly bedded limestone units alternating with thin (2″ to 2′) marl layers. The two massive limestone units with the intervening two-foot marl bed observed at Locality 3 are also recognizable here about 150 yards downstream from Crowley Road. The formation is relatively fossiliferous, the most common fossils being the nautiloid *Cymatoceras,* the turreted ammonite *Turrilites* and the large clam *Pachymya austinensis.* Other fossils occurring in these beds, but less commonly, are *Pecten texanus, Holectypus castelloi,* and *Ostrea* sp.

PAWPAW SHALE. The Pawpaw is represented at this locality by about four feet of a grey to bronze marl containing several thin layers of ironstone. About 1 to 2 feet below the contact with the Main Street limestone there is a shell bed made of the pelecypods *Ostrea carinata* and *Plicatula* and the large foraminifer *Haplostiche texana.* Other fossils are comparatively rare.

LOCALITY 6: SANTA FE RAILROAD CUTS

Southwestern Tarrant County

Figure 7.

In three cuts along the Santa Fe Railroad about 100 yards north of the trestle over Mustang Creek there is a section of the upper 30 feet of the Duck Creek limestone and the lower ten feet of the Fort Worth limestone. The lower part of the section is exposed in the southernmost cut, and in the northernmost the upper Duck Creek marl and lower Fort Worth limestone crop out.

DUCK CREEK FORMATION. The Duck Creek formation was named by Hill in 1891 (p. 516) for 120 feet of limestone and marl exposed along Duck Creek about two miles north of Denison, Grayson County, Texas. In Tarrant County the formation is much thinner, ranging from an estimated 60 feet in the northern part of the county to about 53 feet at this locality. In this area the formation consists of a lower thickly bedded, fucoidal limestone sequence (40 feet thick) and an upper marl with thin marly limestone bands (13 feet thick). The formation bears a conformable relationship to the overlying Fort Worth formation and the boundary is obscure. This contact is usually placed at the top of the marl sequence just described, and hence at the base of the regularly alternating limestone and marl section.

The basal limestone bed in the Duck Creek is characterized by an abundance of the "candy-cane" ammonite *Hamites.* The overlying

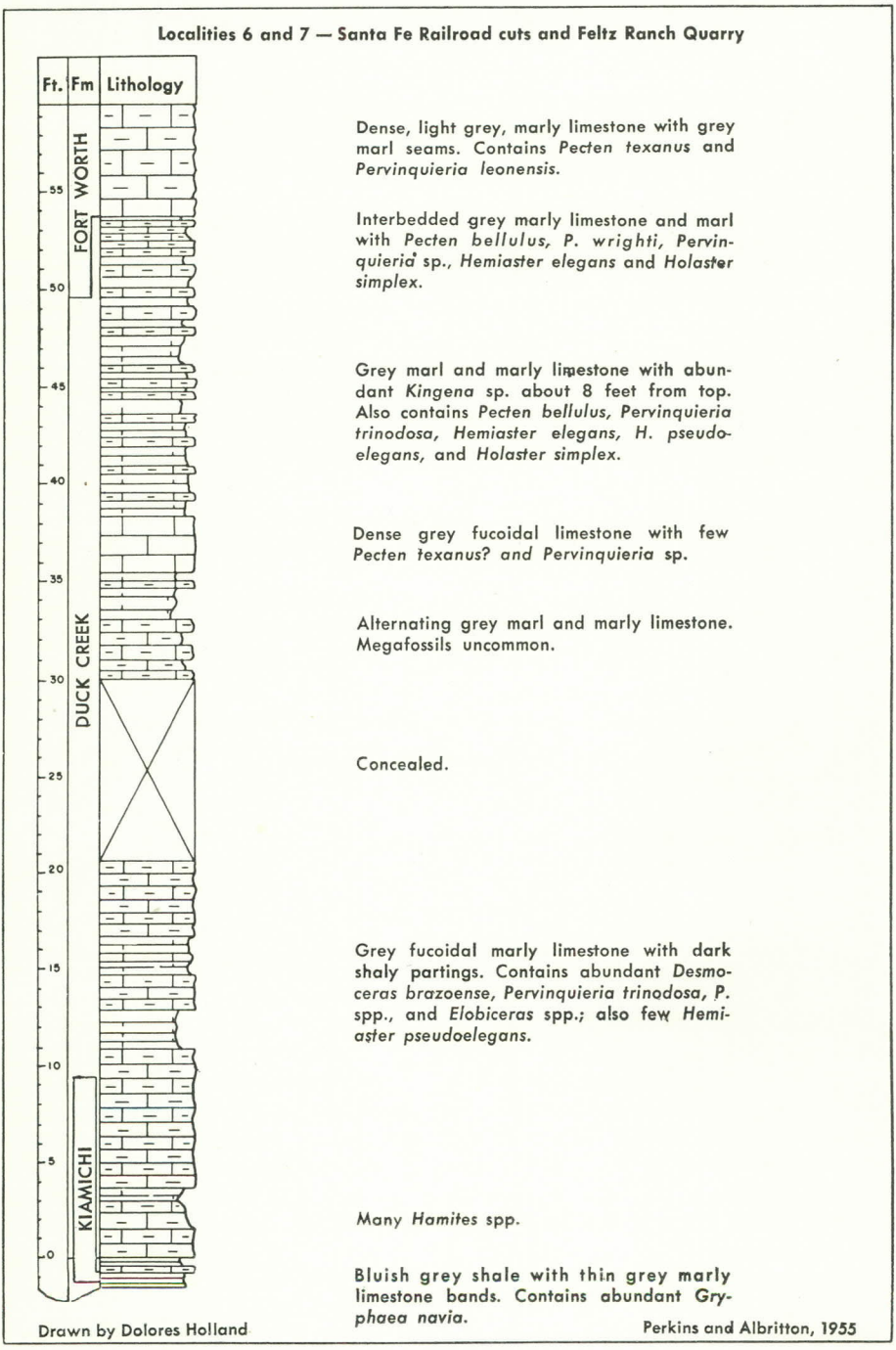

Figure 7. Graphic section of locality along Santa Fe Railroad and in Feltz Ranch Quarry, southwestern Tarrant County, Texas.

limestone section also contains an abundance of ammonites, the most common forms being *Desmoceras, Elobiceras,* and *Pervinquieria.* The overlying marl contains numerous specimens of the large echinoid *Hemiaster pseudoelegans,* and about 8 to 10 feet from the top of the formation the brachiopod *Kingena* is abundant.

FORT WORTH LIMESTONE. The basal beds of the Fort Worth limestone exposed at this locality show the same type of regularly alternating sequence of limestone and marl as seen at Locality 5. In the beds at this locality the common fossils include the echinoid *Holaster simplex,* the pelecypod *Pecten texanus,* and the ammonite *Pervinquieria leonensis.*

LOCALITY 7: FELTZ RANCH QUARRY

Figure 7.

The basal 20 foot limestone section of the Duck Creek limestone and the upper two feet of the underlying Kiamichi (Fredericksburg Group) formation are exposed on the west side of the Santa Fe railroad about 200 yards south of Rocky Creek in a recently abandoned quarry on the Feltz Ranch.

DUCK CREEK FORMATION. The lower limestone member of the Duck Creek formation as exposed here consists of limestone beds 6 inches to 1 foot thick separated by seams of marl. The formation apparently is conformable with the Kiamichi formation.

This locality is a good one for collecting large ammonites. The most common genera are *Desmoceras* and *Pervinquieria.* Less abundant is *Elobiceras,* and in the basal 2 foot limestone unit the small ammonite *Hamites* occurs.

KIAMICHI FORMATION. The name Kiamichi was given by Robert T. Hill in 1891 (pp. 504, 515) to exposures of a blue marl with thin limestone beds in the valley of the Kiamichi River near Fort Towson, Choctaw County, Oklahoma. In the Feltz Ranch quarry the formation consists of blue shale with thin limestone bands and is characterized by an abundance of the sharp-beaked oyster, *Gryphaea navia.*

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PLATES

PLATE 1

[All figures natural size.]

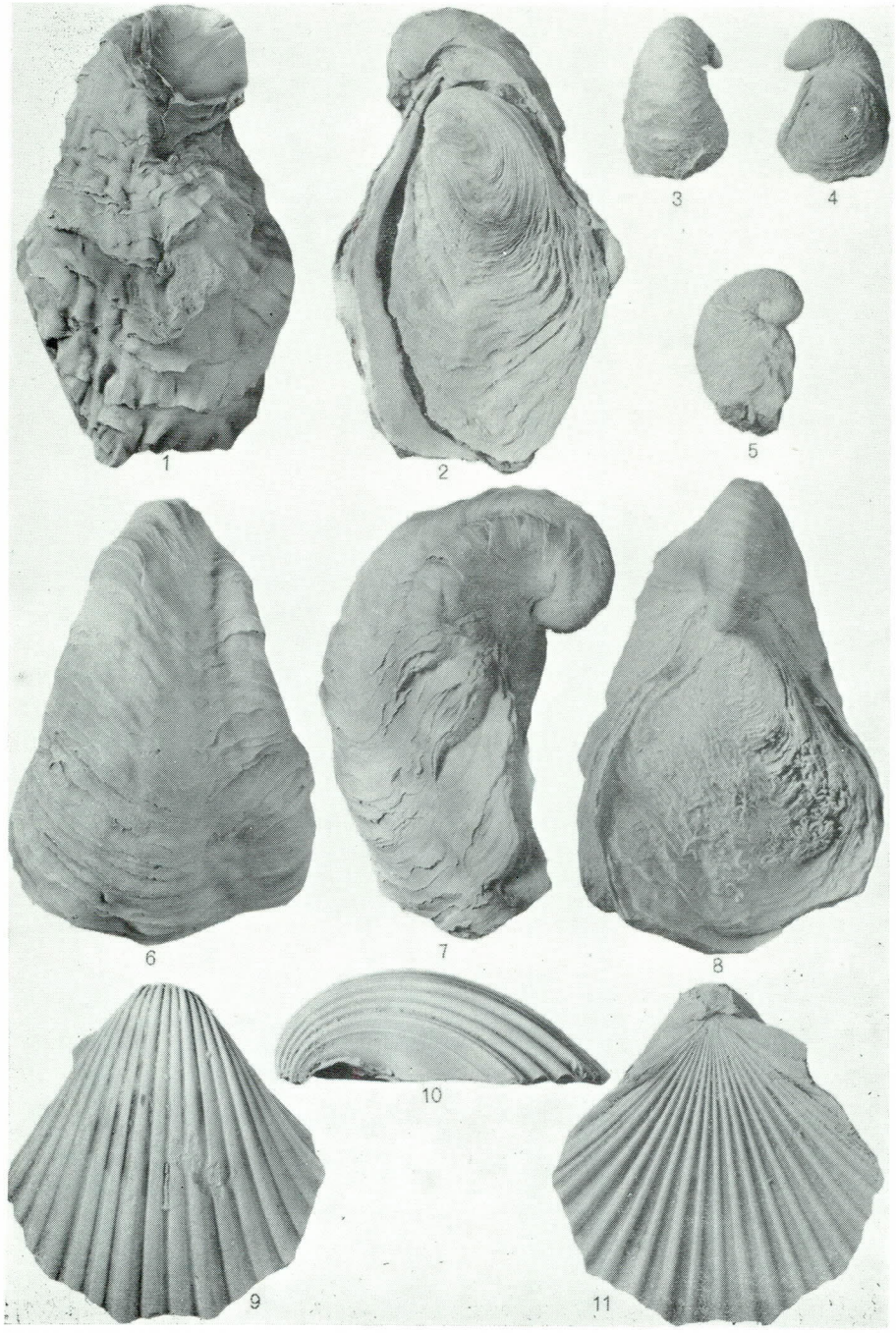
Figure

1,2. *Exogyra drakei* Cragin. S.M.U. 1161.

3-5. *Exogyra arietina* Roemer. S.M.U. 1201.

6-8. *Gryphaea graysonana* Stanton. S.M.U. 1132.

9-11. *Pecten (Neithea) texanus* Roemer. S.M.U. 1134.
All specimens from the Grayson marl at Grayson Bluff, Denton County, Texas.



WASHITA FOSSILS

PLATE 2

[All figures 2/5 natural size.]

Figure

1-3. *Pachymya austinensis* Shumard. S.M.U. plastotype 1023, from upper part of Washita group, 2 miles east of Gainesville, Cooke County, Texas. Original in F. W. Cragin collection at Colorado College, Colorado Springs, Colorado.

WASHITA FOSSILS

PLATE 3

[Figures natural size unless otherwise indicated.]

Figure

1-3. *Holectypus (Coenholectypus) castilloi* Cotteau. S.M.U. 1241, from Grayson marl at Grayson Bluff, Denton County, Texas.

4-6. *Kingena wacoensis* (Roemer). S.M.U. 1234, from Main Street limestone in benches south of Grayson Bluff, Denton County, Texas.

7,8. *Plicatula subgurgitis* Böse. S.M.U. 1105, from the Pawpaw shale south of Seminary Drive and 100 yards east of Sycamore Creek, Fort Worth, Tarrant County, Texas.

9. *Ostrea (Lopha) quadriplicata* Shumard. S.M.U. 1111, from the Weno formation at the west end of Atkins Street along the International and Great Northern Railroad, Fort Worth, Tarrant County, Texas.

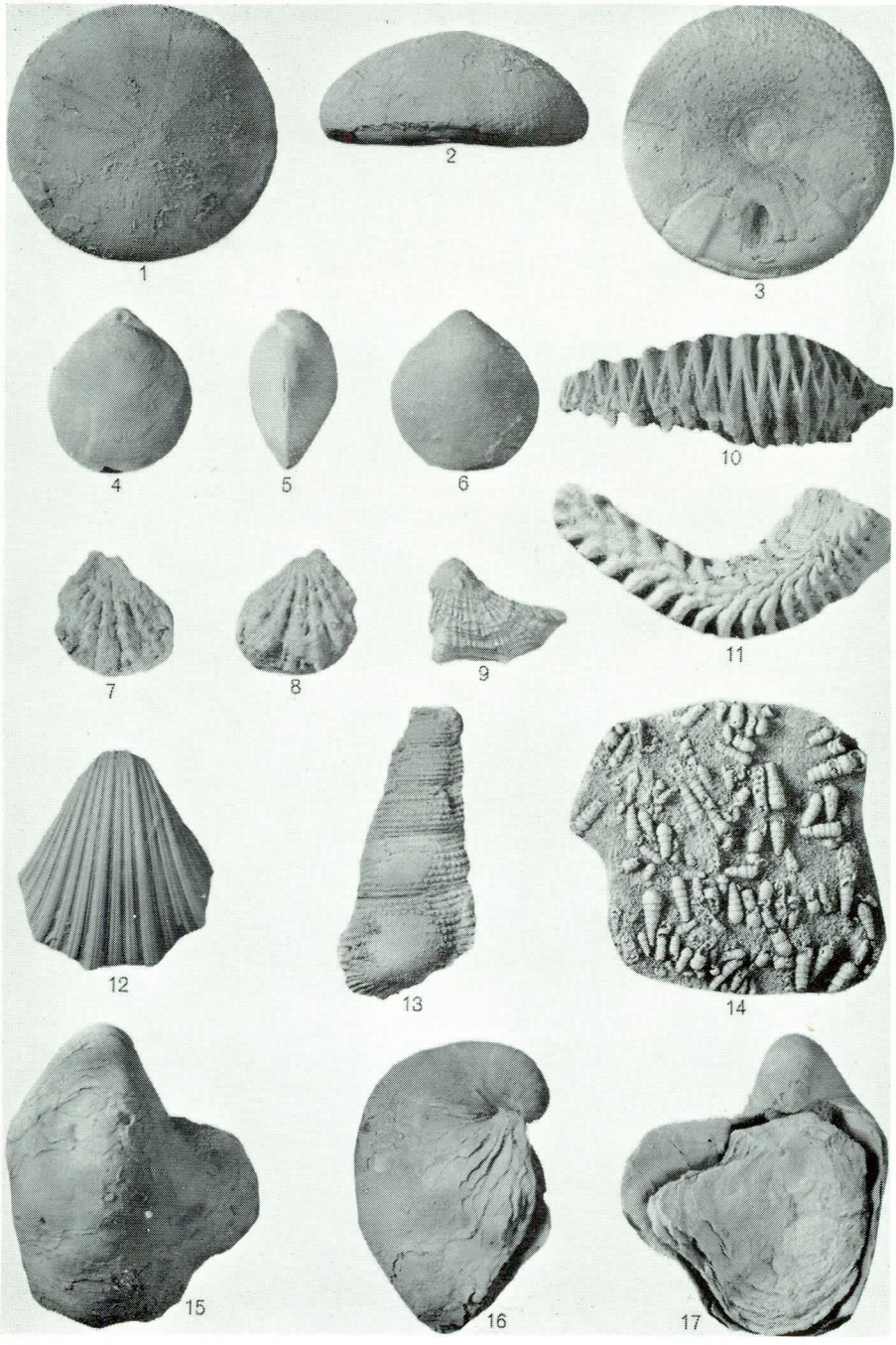
10,11. *Ostrea (Arctostrea) carinata* Lamarck. S.M.U. 1212, from the Pawpaw shale on Sycamore Creek east of Crowley Road, Tarrant County, Texas.

12. *Pecten (Neithea) georgetownensis* Kniker. S.M.U. 1186, from the Weno formation on Sycamore Creek about 300 yards south of Seminary Drive, Fort Worth, Tarrant County, Texas.

13. *Turritella ventrivoluta* Cragin. S.M.U. 1189, from the Weno formation on Sycamore Creek about 100 yards north of the International and Great Northern Railroad bridge.

14. *Haplostiche texana* (Conrad), X 1½. S.M.U. 1253, from the Pawpaw shale on Sycamore Creek east of Crowley Road, Tarrant County, Texas.

15-17. *Gryphaea washitaensis* Hill. S.M.U. 1218, from the Denton marl on Sycamore Creek in Cobb Park, Fort Worth, Tarrant County, Texas.



WASHITA FOSSILS

PLATE 4

[All figures natural size.]

Figure

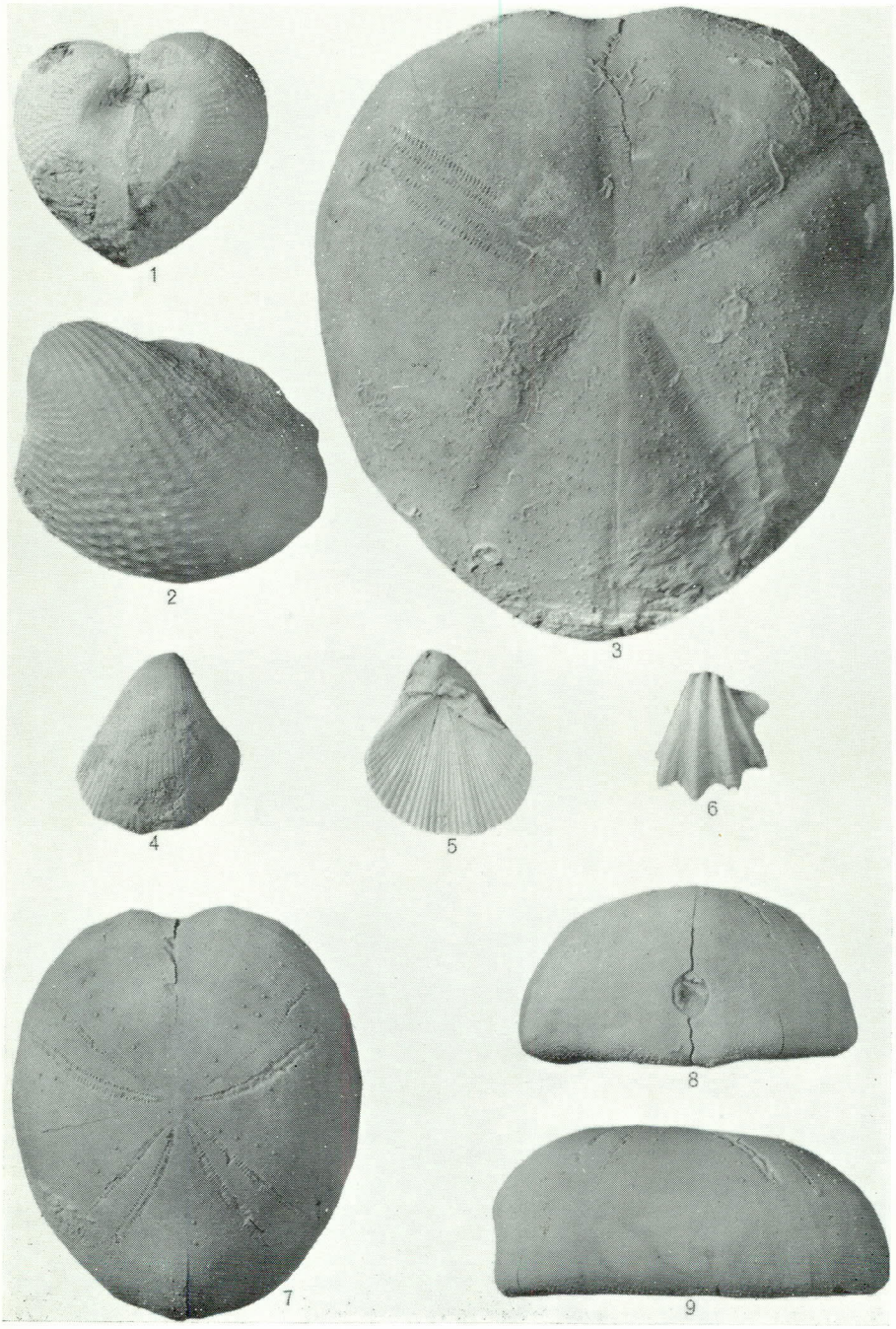
1,2 *Pholadomya shattucki* Böse. S.M.U. 1248, from the Main Street limestone on Village Creek south of Polly Webb Road, Tarrant County, Texas.

3. *Hemiaster (Macraster) elegans* Shumard. S.M.U. 1083, from the Fort Worth limestone in Glenwood Park, Fort Worth, Tarrant County, Texas.

4,5. *Pecten (Neithea) bellulus* (Cragin). S.M.U. 1173, from the Fort Worth limestone in Santa Fe Railroad cut about ½ mile northeast of Mustang Creek, Tarrant County, Texas.

6. *Pecten (Neithea) wrighti* (Shumard). S.M.U. 1174, from the Fort Worth limestone in Santa Fe Railroad cut about ½ mile northeast of Mustang Creek, Tarrant County, Texas.

7-9. *Holaster simplex* Shumard. S.M.U. 1071, from the Fort Worth limestone in Santa Fe Railroad cut about ½ mile northeast of Mustang Creek, Tarrant County, Texas.



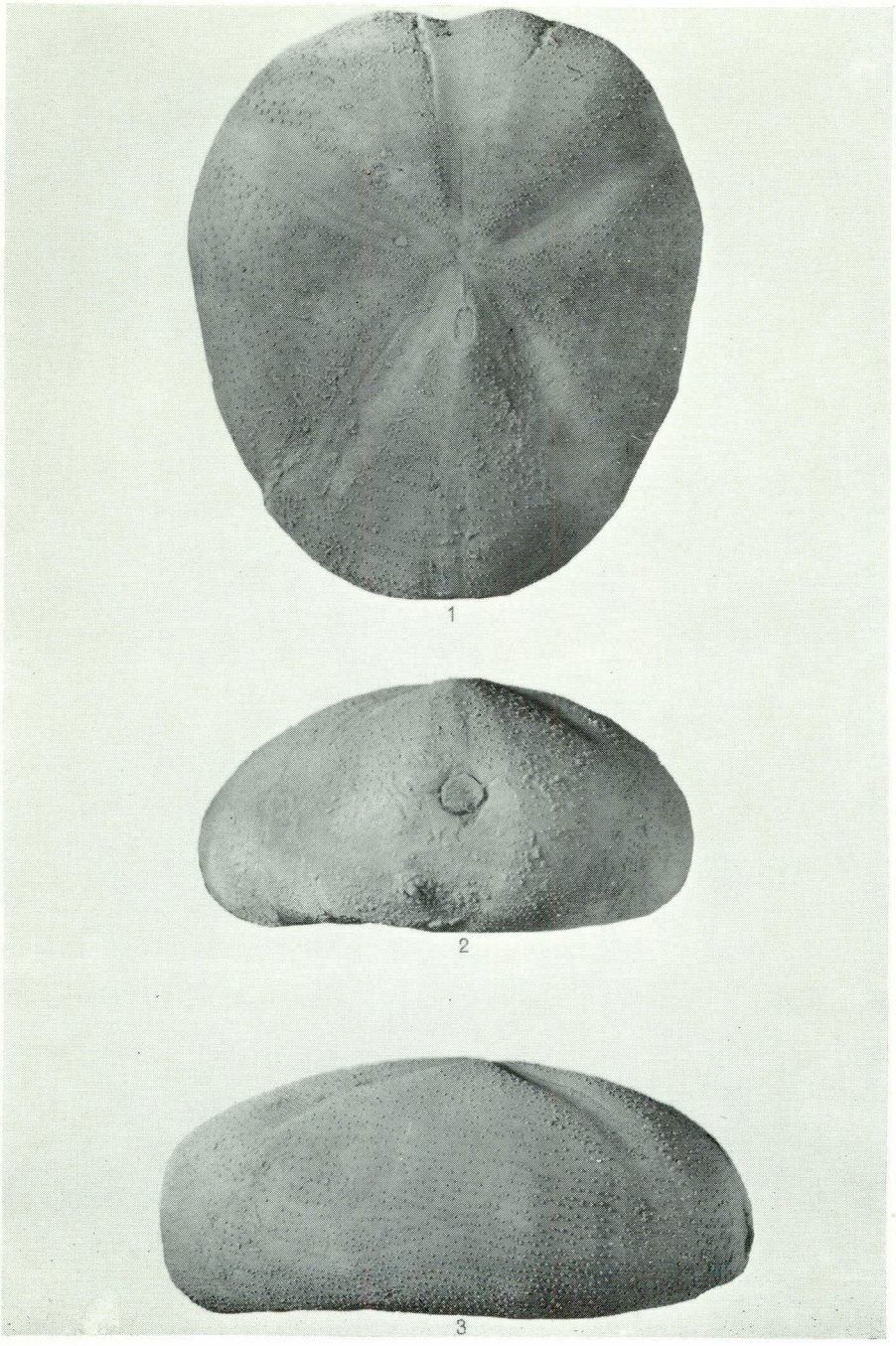
WASHITA FOSSILS

PLATE 5

[All figures natural size.]

Figure

1-3. *Hemiaster (Macraster) subobesus* (Adkins). S.M.U. 1081, from the Duck Creek formation in Santa Fe Railroad cut about ¼ mile northeast of Mustang Creek, Tarrant County, Texas.



WASHITA FOSSILS

MAP SHOWING THE ROUTE OF THE WASHITA GROUP FIELD EXCURSION IN THE VALLEY OF THE TRINITY RIVER, TEXAS

SCALE

0 1 2 Miles

BASE MAP FROM TEXAS STATE HIGHWAY DEPT., 1949