



Late Triassic vertebrates from the Dockum Formation near Otis Chalk, Howard County, Texas

Spencer G. Lucas, Adrian P. Hunt, and Robert Kahle
1993, pp. 237-244. <https://doi.org/10.56577/FFC-44.237>

in:
Carlsbad Region (New Mexico and West Texas), Love, D. W.; Hawley, J. W.; Kues, B. S.; Austin, G. S.; Lucas, S. G.; [eds.], New Mexico Geological Society 44th Annual Fall Field Conference Guidebook, 357 p.
<https://doi.org/10.56577/FFC-44>

This is one of many related papers that were included in the 1993 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual [Fall Field Conference](#) that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

Copyright Information

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

This page is intentionally left blank to maintain order of facing pages.

LATE TRIASSIC VERTEBRATES FROM THE DOCKUM FORMATION NEAR OTIS CHALK, HOWARD COUNTY, TEXAS

SPENCER G. LUCAS¹, ADRIAN P. HUNT¹ and ROBERT KAHLE²

¹New Mexico Museum of Natural History and Science, 1801 Mountain Road NW, Albuquerque, New Mexico 87104;

²Department of Geology, University of Colorado at Denver, Campus Box 172, P.O. Box 173364, Denver, Colorado 80217-3364; 4305 Roosevelt Road, Midland, Texas 79703

Abstract—Fossil vertebrates from the Otis Chalk area of Howard County, Texas represent a diverse fauna of fishes, amphibians and reptiles. These fossils are from the Iatan Member of the Upper Triassic Dockum Formation. The presence of the phytosaur *Paleorhinus* indicates a late Carnian (early Tuvallian) age for the vertebrate fauna.

INTRODUCTION

One of the most extensive fossil assemblages of Late Triassic vertebrates from the Dockum Formation was collected during and since the 1920s in low-lying badlands north of the now defunct town of Otis Chalk, Howard County, Texas (Figs. 1, 2). These vertebrate fossils are among the oldest Late Triassic vertebrates known from the western United States. Here, we establish the stratigraphic position of the Otis Chalk vertebrates and review them in the light of recent studies and new discoveries.

STRATIGRAPHIC CONTEXT

An approximately 100-m-thick section of the Dockum Formation is exposed in Mitchell and Howard Counties, Texas between Champion Creek Lake, south of Colorado City, and Signal Peak just southeast of Big Spring. The base of this section is about 15-20 m of clast-supported siliceous conglomerate and conglomeratic sandstone well exposed along the southeastern shore of Champion Creek Lake (UTM 3572950N,

326000E and vicinity). These strata are assigned to the Camp Springs Member of the Dockum Formation and disconformably overlie Upper Permian red beds of the Quartermaster (= Dewey Lake) Formation (Lucas and Anderson, 1992, 1993a, b).

Dockum strata above the Camp Springs Member in Howard and Mitchell Counties are about 80 m of intercalated reddish brown to grayish red smectitic mudstone, and pale orange to yellowish brown trough crossbedded, micaceous subarkosic sandstone (Fig. 1). These strata are the Iatan Member of the Dockum Formation (Lucas and Anderson, 1993b).

Sandstones of the Iatan Member form persistent benches/escarpments above mudstone slopes and badland areas. Four such benches/escarpments can be identified between Champion Creek Lake and Signal Peak above a fifth bench formed by the Camp Springs Member (Grover, 1984; Lucas and Anderson, 1992, 1993a, b). The Otis Chalk fossil vertebrates are present in the mudstone of the Iatan Member between the third and fourth sandstones (Fig. 1).

VERTEBRATE FAUNA

Previous studies

A. B. (Bun-el) Cramer (1904-1993) originally discovered vertebrate fossils near Otis Chalk in the 1920s. Subsequently, E. C. Case from the University of Michigan and J. W. Stovall from the University of Oklahoma collected phytosaur specimens from the area, including the holotypes of the phytosaurs *Brachysuchus megalodon* and *Angistorhinus alticephalus*. Substantial collections of fossil vertebrates were made by crews of the WPA (Works Progress Administration) from 1939 to 1941, which resulted in the descriptions of the new aetosaur "*Typothorax*" (= *Longosuchus*) *meadei* and the new amphibian *Buettneria "howardensis"* (= *B. perfecta*) (Sawin, 1944, 1947; Hunt and Lucas, 1990; Hunt, 1993). A complete osteology of the reptile *Trilophosaurus* also was based on these collections (Gregory, 1945).

Elder (1978, 1987) reviewed the WPA collections and Murry (1982, 1989) screenwashed for microvertebrates in the area. Chatterjee (1986) and Hunt and Lucas (1991b) have named a new proterosaur and a new rhynchosaur, respectively, from the WPA collections. Schaeffer (1967) described several new taxa from a quarry rich in macerated and partial fish. Most recently, the New Mexico Museum of Natural History and Science and the third author (RK) have made extensive collections. The fossils illustrated here are in the personal collection of RK. All Otis Chalk area Triassic vertebrate localities (Fig. 2) are located on private ranch land.

Taxa

Class Chondrichthyes

Lissodus sp.—One tooth similar to *Lissodus humblei* Murray (Murry, 1989).

Class Osteichthyes

Arganodus sp.—Toothplates of this lungfish were reported by Murry (1989).

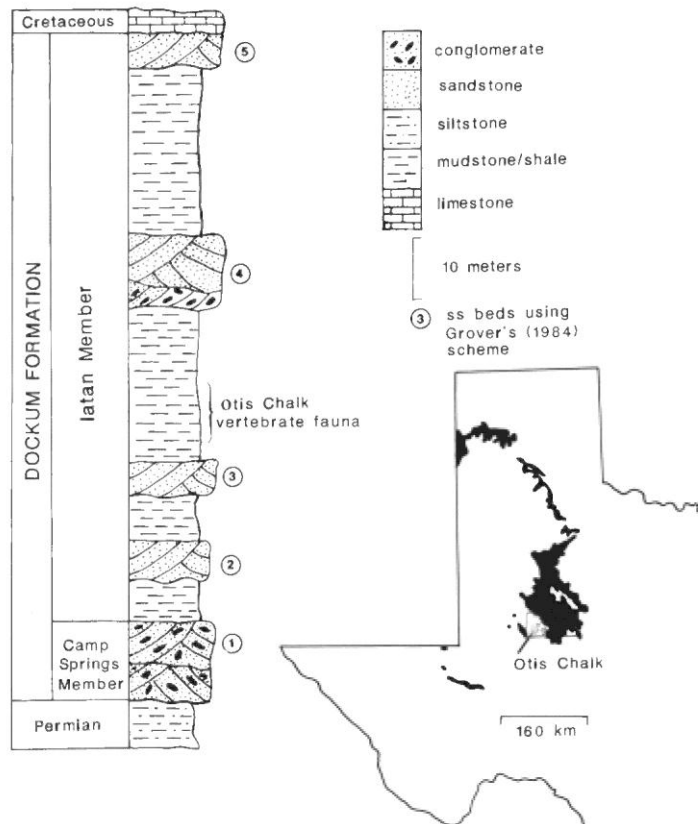


FIGURE 1. Generalized Upper Triassic stratigraphy of the Otis Chalk area and its location in the Dockum Formation outcrop belt of west Texas.

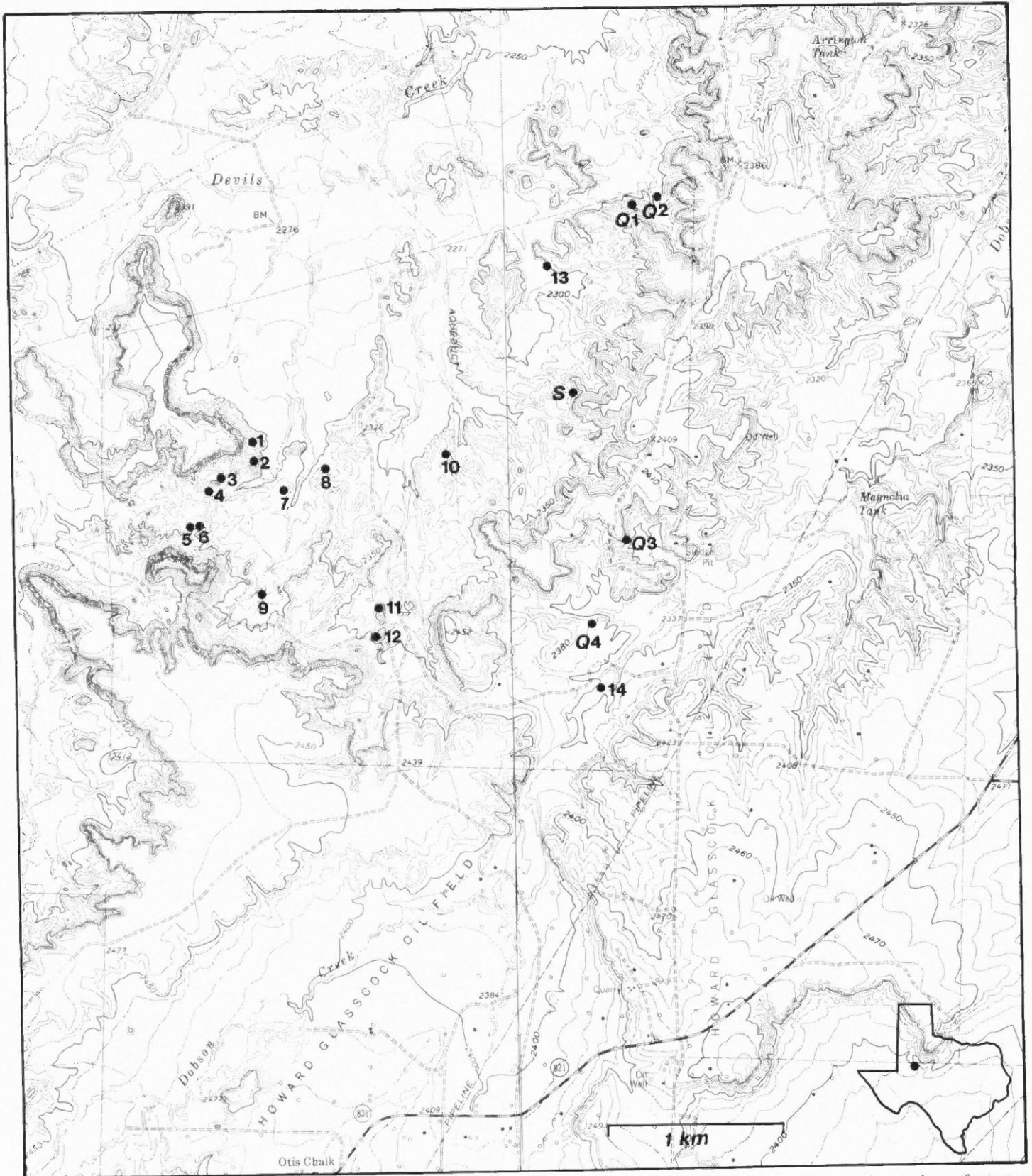


FIGURE 2. Fossil vertebrate localities of the Otis Chalk area. Q1–4 are WPA quarries, S is the Schaeffer (1967) fish locality, and other numbers refer to new localities. Note that our placement of some of the WPA quarries differs from the map coordinates of these localities listed by Elder (1978).

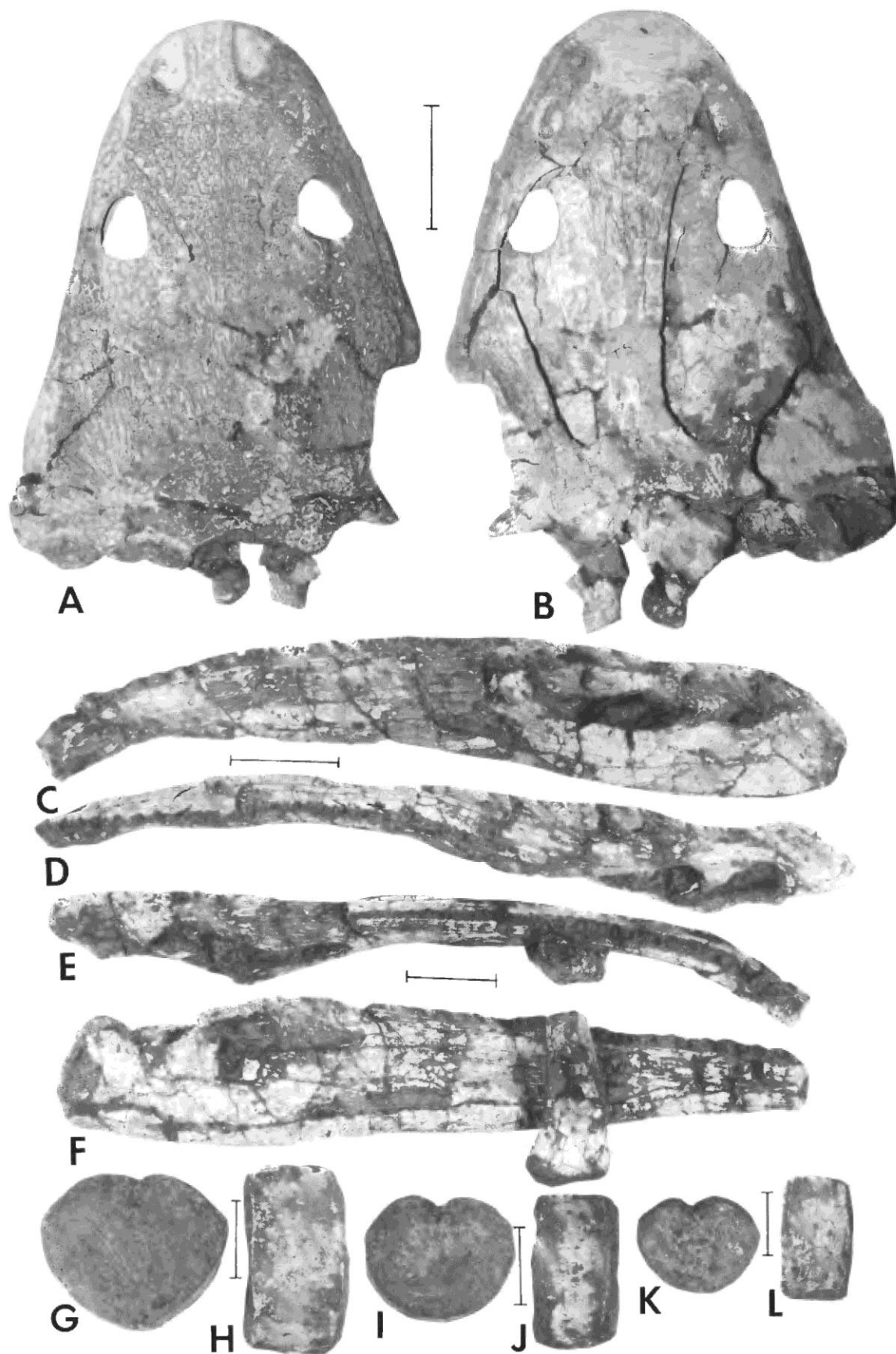


FIGURE 3. *Buettneria perfecta* from the Iatan Member of the Dockum Formation, Howard County, Texas. A–B, Skull in dorsal (A) and ventral (B) view (locality 11 of Fig. 2). C–F, Two lower jaw arcs in medial (C), ventral (D), occlusal (E) and lateral (F) views (locality Q2 of Fig. 2); note distal end of *Trilophosaurus* femur attached to jaw arcade in E–F. G–L, Intercentra in anterior (G, I, K) and ventral (H, J, L) views (locality Q2 of Fig. 2). Scale bars are 10 cm (A–B), 2 cm (C–F) and 1 cm (G–L).

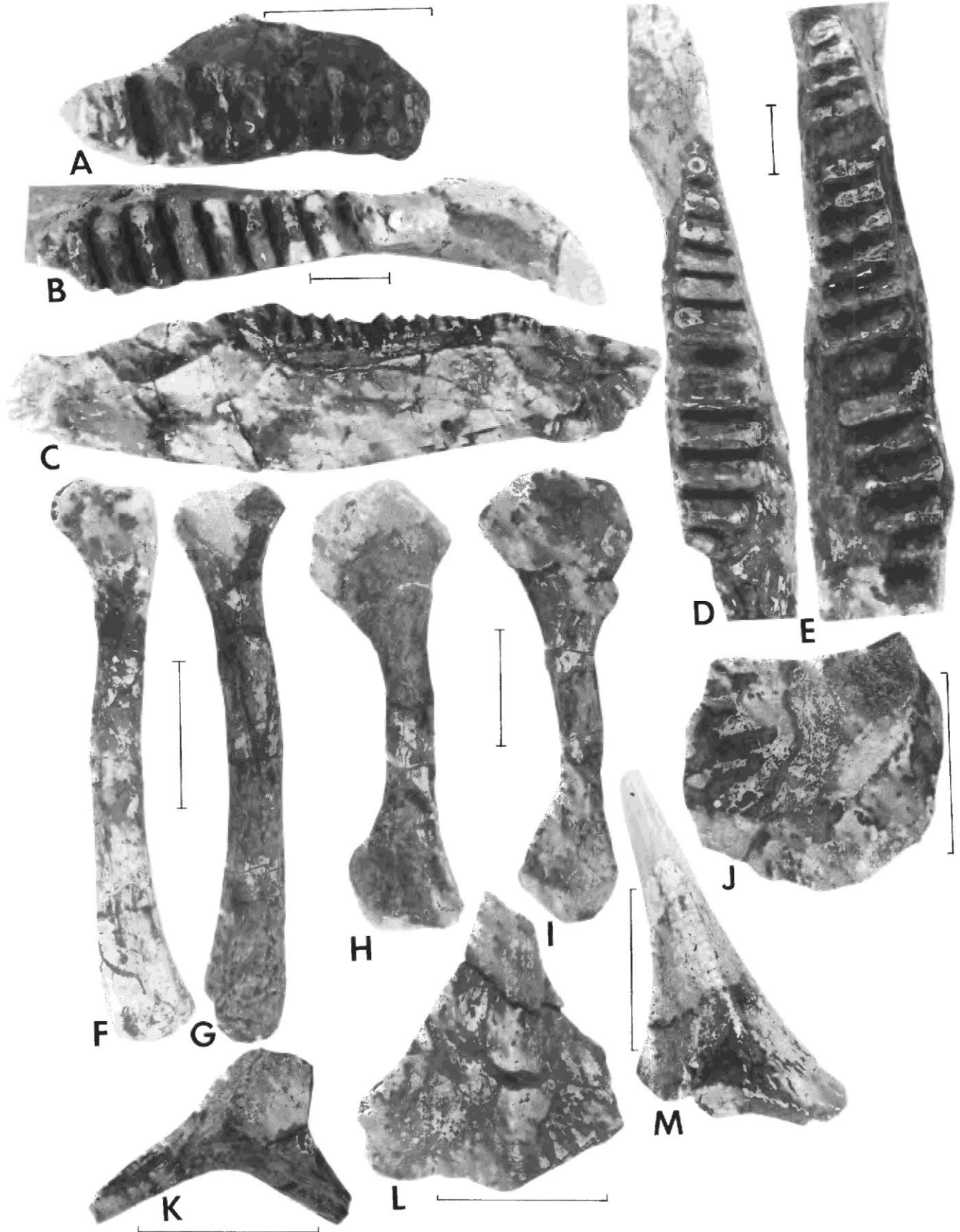


FIGURE 4. *Trilophosaurus buettneri* (A–I) and *Longosuchus meadei* (J–M) from the Iatan Member of the Dockum Formation, Howard County, Texas. A–I, *Trilophosaurus buettneri* (locality Q2 of Fig. 2). A, Left maxilla. B–E, Lower jaws (left—B, C, E, right—D) in medial (C) and occlusal (B, D–E) views. F–G, Right femur in ventral (F) and dorsal (G) views. H–I, Left humerus in dorsal (H) and ventral (I) views. J–M, Scutes of *Longosuchus meadei* in dorsal (J) and lateral (K–M) views (locality 7 of Fig. 2). Scale bars are 2 cm (A–E) and 5 cm (F–M).

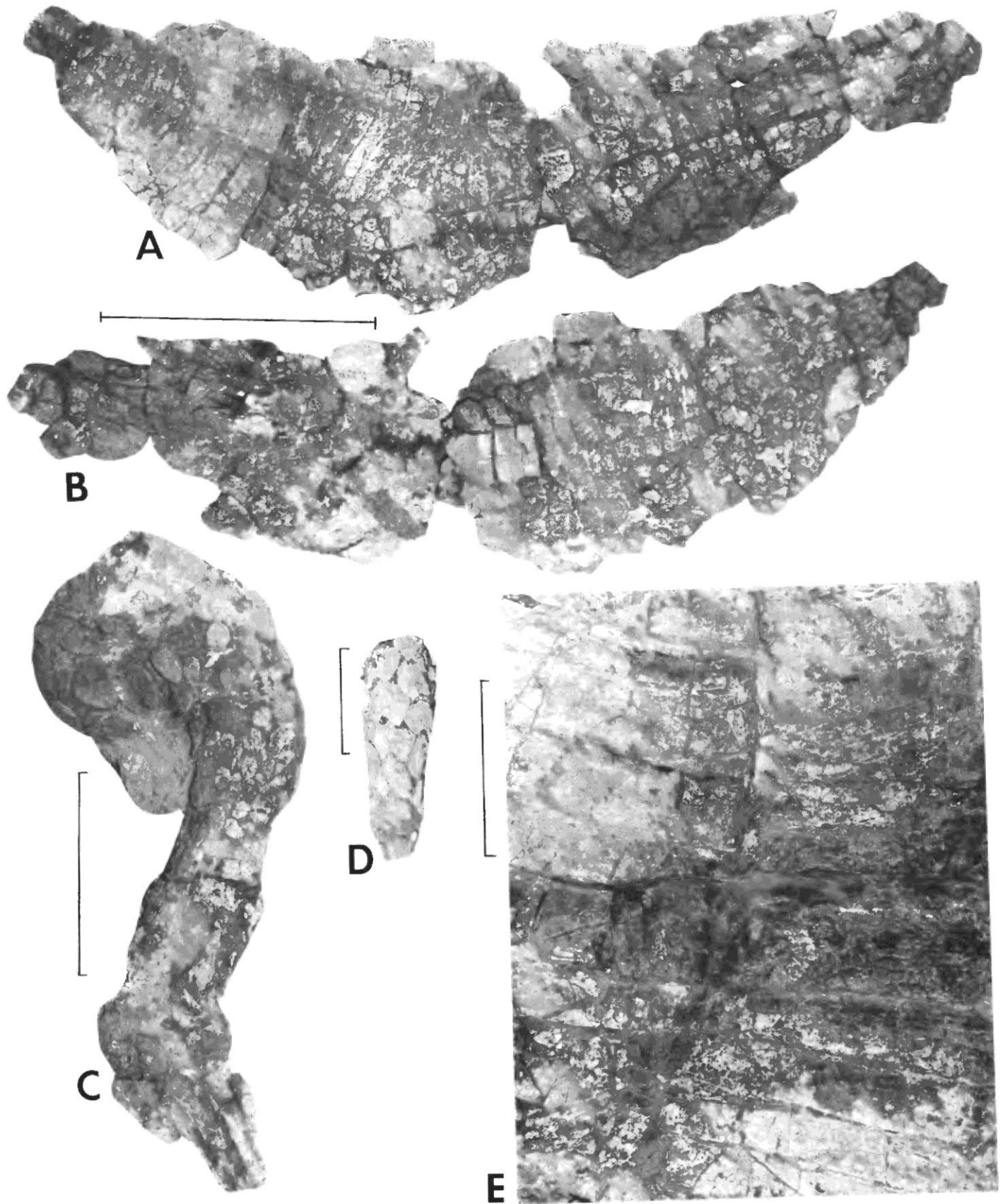


FIGURE 5. Skeleton of a new aetosaur genus from the Jatan Member of the Dockum Formation, Howard County, Texas (locality 6 of Fig. 2). A–B, Carapace in dorsal (A) and ventral (B) views. C, Hind limb in lateral view. D, Tip of tail in dorsal view. E, Close view of paramedian scutes in articulation. Scale bars are 2 cm (D–E), 5 cm (C) and 20 cm (A–B).

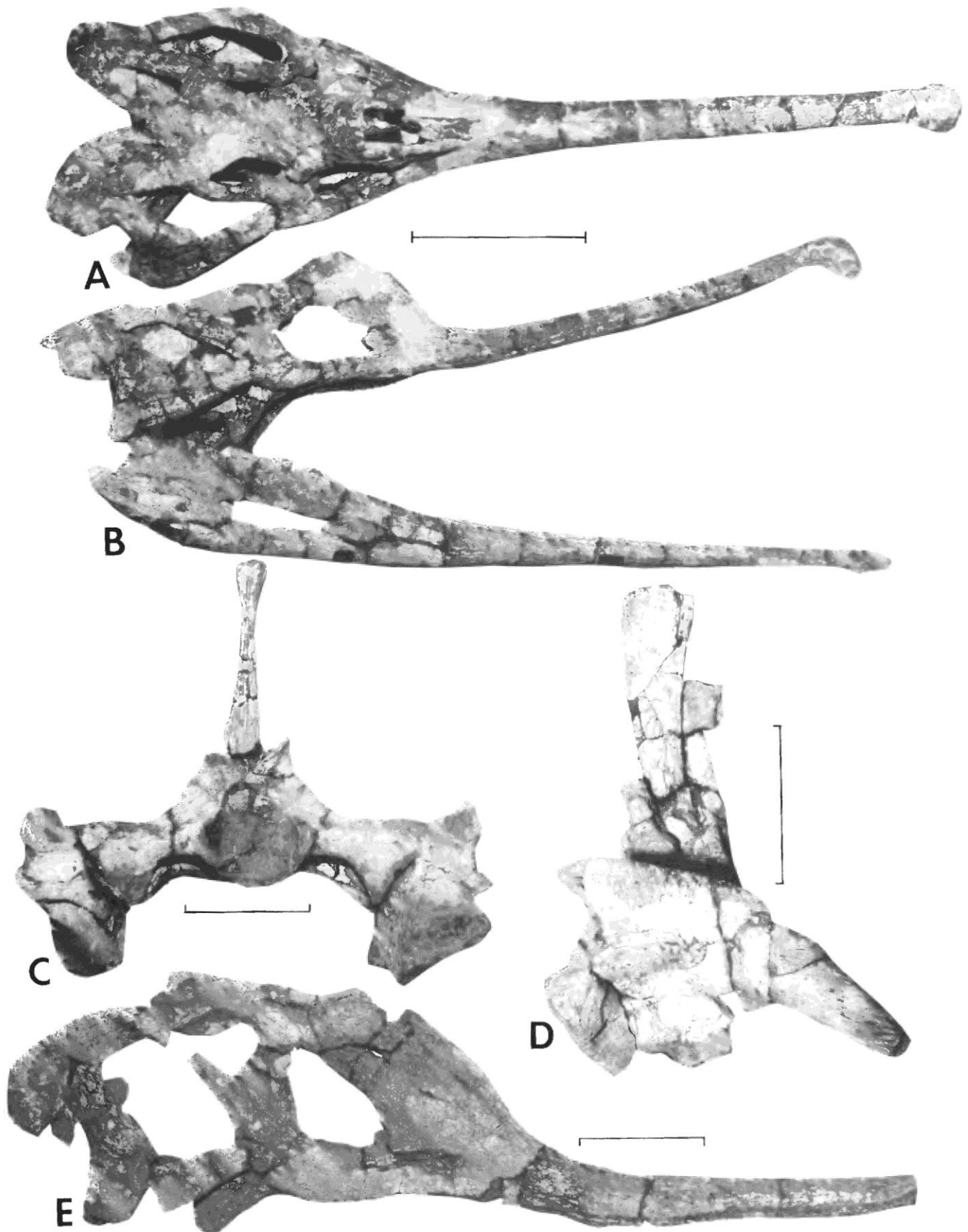


FIGURE 6. *Angistorhinus alticephalus* from the Iatan Member of the Dockum Formation, Howard County, Texas. A–B, Skull and lower jaws in dorsal (A) and lateral (B) views (locality 9 of Fig. 2). C–D, Articulated pelvis in posterior (C) and lateral (D) views (same individual as A–B). E, Skull in lateral view (locality 2 of Fig. 2). Scale bars are 10 cm (C–D) and 20 cm (A–B, E).

- Colobodontidae—Unidentified colobodontid tooth plates (Murry, 1986). cf. *Turseodus* sp.—Corrugated scales (Murry, 1986, 1989).
- Cionichthys greeni* Schaeffer, 1967—Schaeffer (1967) described this taxon from several partial skeletons found in the fish quarry.
- Lasalichthys hillsi* Schaeffer, 1967—One specimen from the Otis Chalk fish quarry (Schaeffer, 1967).
- Sinorichthys stewarti* Schaeffer, 1967—This redfieldiid is known from several partial skulls and isolated dermal bones from the fish quarry (Schaeffer, 1967).

Class Amphibia

- Laticopus disjunctus* Wilson, 1948—This enigmatic labyrinthodont is known only from the holotype skull from Otis Chalk (Wilson, 1948).
- Buettneria perfecta* Case, 1922—Sawin (1944) described several skulls and much postcrania as *Buettneria howardensis*, but all these specimens, as well as recently collected specimens (Fig. 3), pertain to the typical North American taxon *B. perfecta* (Hunt, 1993).
- Apachesaurus* sp.—Isolated intercentra represent this diminutive metoposaur.

Class Reptilia

- Otischalkia elderae* Hunt and Lucas, 1991b—A hyperodapadontine rhynchosaur represented by limb elements and premaxillae (Hunt and Lucas, 1991 b).
- Trilophosaurus buettneria* Case, 1928—This unusual reptile forms more than two-thirds of the vertebrate fossils from the WPA quarries I and 2 (Fig. 4A–I). Two sizes of individuals are present and it is not certain whether the two morphs are ontogenetic members of the same species or represent distinct taxa (Gregory, 1945; Elder, 1978; Murry, 1989).
- Malerisaurus langstoni* Chatterjee, 1986—Chatterjee (1986) described this long-necked proterosaur from WPA quarry 2. Procolophonidae—Reported by Murry (1989).
- "Primitive reptiles"—Elder (1978) figured jaw elements with rows of ankylotheodont teeth. These specimens are so similar to specimens of Lower Permian captorhinids that we suspect that they are contaminants to the Otis Chalk fauna. We note that WPA groups also excavated Early Permian localities. Elder (1978) also described other taxa with ankylotheodont dentition that have a single tooth row. She assigned these specimens to the Proterosuchia, although no synapomorphies support this hypothesis.
- Poposaurus gracilis* Mehl, 1922—All rausuchian specimens from Otis Chalk probably pertain to this taxon.
- Longosuchus meadei* (Sawin, 1947) One of the best-known aetosaurs from North America because of the abundant specimens from Otis Chalk (Sawin, 1947; Hunt and Lucas, 1990). Recently collected specimens include distinctive dermal scutes of this taxon (Fig. 4J–M).
- New aetosaur genus—An articulated skeleton from Otis Chalk pertains to a new genus of aetosaurs (Fig. 5), which is distinguished by its very wide dorsal paramedian scutes with radial ornamentation. This specimen exhibits a waisted carapace anterior to the pelvis and lacks raised bosses on the dorsal paramedian scutes. It differs from *Stagonolepis*, the most similar other aetosaur, in having caudal scutes in which the bosses on the paramedian dorsal scutes become higher posterior to the pelvis. This new aetosaur genus will be described elsewhere.
- Paleorhinus bransoni* Williston, 1904—This primitive phytosaur is represented by at least five skulls from the Otis Chalk area (Hunt and Lucas, 1991a).
- Angistorhinus alticephalus* Stovall and Wharton, 1936—This phytosaur is represented by the holotype skull and two new skulls, one of which is associated with much of a postcranial skeleton (Fig. 6).
- Brachysuchus megalodon* Case, 1929—This robust phytosaur was placed in the genus *Angistorhinus* by many previous workers.

CORRELATION

The presence of the phytosaur *Paleorhinus* in the Otis Chalk fauna indicates an early Tuvallian age (Hunt and Lucas, 1991a). *Paleorhinus* is found in the Camp Springs Member of the Dockum Formation throughout its outcrop belt, in the Blue Mesa Member of the Petrified Forest Formation in northeastern Arizona and the Popo Agie Formation in Wyoming (Hunt and Lucas, 1991a). *Paleorhinus-bearing* faunas represent the oldest known Late Triassic faunas in western North America (Lucas, 1993).

ACKNOWLEDGMENTS

Carl Frailey, Pete Reser, Phil Bircheff and Orin Anderson made fieldwork in the Otis Chalk area possible and productive. Adam Kahle collected some of the fossils illustrated here. Several ranchers graciously granted access to their land. Martin G. Lockley and Robert M. Sullivan provided helpful reviews of the manuscript.

REFERENCES

- Case, E. C., 1922, New reptiles and stegocephalians from the Upper Triassic of western Texas: Carnegie Institution of Washington, Publication 321, p. 184.
- Case, E. C., 1928, Indications of a cotylosaur and of a new form of fish from the Triassic beds of Texas, with remarks on the Shinarump Conglomerate: University of Michigan, Museum of Paleontology Contributions, v. 3, p. 114.
- Case, E. C., 1929, Description of the skull of a new form of phytosaur: Michigan State University, Paleontological Memoir 2, p. 1-56.
- Chatterjee, S., 1986, *Malerisaurus langstoni*, a new diapsid reptile from the Triassic of Texas: Journal of Vertebrate Paleontology, v. 6, p. 297-312.
- Elder, R. L., 1978, Paleontology and paleoecology of the Dockum Group, Upper Triassic, Howard County, Texas [M.S. thesis]: Austin, University of Texas, 205 p.
- Elder, R. L., 1987, Taphonomy and paleoecology of the Dockum Group, Howard County, Texas: Journal of the Arizona-Nevada Academy of Sciences, v. 22, p. 85-94.
- Gregory, J. T., 1945, Osteology and relationships of *Trilophosaurus*: University of Texas, Publication 4401, p. 273-359.
- Grover, G. Jr., 1984, Second day road log; in Grover, G. Jr., ed., Lower Permian to Upper Pliocene carbonate and elastic facies, southeastern shelf, Texas: Midland, West Texas Geological Society, p. 24-33.
- Hunt, A. P., 1993, A revision of the Metoposauridae (Amphibia: Temnospondyli) of the Late Triassic with a description of a new genus from western North America: Bulletin of the Museum of Northern Arizona, in press.
- Hunt, A. P. and Lucas, S. G., 1990, A re-evaluation of "*Typhothorax*" *meadei*, a Late Triassic aetosaur from the United States: Palaontologisches Zeitschrift, v. 64, p. 317-328.
- Hunt, A. P. and Lucas, S. G., 1991a, The *Paleorhinus* biochron and the correlation of the non-marine Upper Triassic of Pangaea: Palaeontology, v. 34, p. 487-501.
- Hunt, A. P. and Lucas, S. G., 1991b, A new rhynchosaur from West Texas (USA) and the biochronology of Late Triassic rhynchosaurs: Palaeontology, v. 34, p. 927-938.
- Lucas, S. G., 1993, The Chinle Group: revised stratigraphy and biochronology of Upper Triassic nonmarine strata in the western United States: Bulletin of the Museum of Northern Arizona, in press.
- Lucas, S. G. and Anderson, O. J., 1992, Triassic stratigraphy and correlation, west Texas and eastern New Mexico; in Cromwell, D. W., Moussa, M. T. and Mazzullo, L. J., eds., Transactions, Southwest Section AAPG, Midland Texas, 1992: Midland, West Texas Geological Society, p. 201-207.
- Lucas, S. G. and Anderson, O. J., 1993a, Lithostratigraphy, sedimentation and sequence stratigraphy of Upper Triassic Dockum Formation, West Texas; in Crick, R. E., ed., 1993 Southwest Section Geological Convention, American Association of Petroleum Geologists, Transactions and Abstracts: Arlington, The University of Texas, p. 55-65.
- Lucas, S. G. and Anderson, O. J., 1993b, Triassic stratigraphy in southeastern New Mexico and southwestern Texas: New Mexico Geological Society, Guidebook 44.
- Mehl, M. G., 1922, A new phytosaur from the Trias of Arizona: Journal of Geology, v. 30, p. 144-157.
- Murry, P. A., 1982, Biostratigraphy and paleoecology of the Dockum Group, Triassic of Texas [Ph.D. dissertation]: Dallas, Southern Methodist University, 459 p.

- Murry, P. A., 1986, Vertebrate paleontology of the Dockum Group, western Texas and eastern New Mexico; *in* Padian, K., ed., The beginning of the age of dinosaurs: faunal change across the Triassic-Jurassic boundary: Cambridge University Press, p. 109-137.
- Murry, P. A., 1989, Geology and paleontology of the Dockum Formation (Upper Triassic), west Texas and eastern New Mexico; *in* Lucas, S. G. and Hunt, A. P., eds., Dawn of the age of dinosaurs in the American Southwest: Albuquerque, New Mexico Museum of Natural History, p. 102-144.
- Sawin, H. J., 1944, Amphibians from the Dockum Triassic of Howard County, Texas: University of Texas, Publication 4401, p. 361-399.
- Sawin, H. J., 1947, The pseudosuchian *Typhothorax meadei*: Journal of Paleontology, v. 21, p. 201-238.
- Schaeffer, B., 1967, Late Triassic fishes from the western United States: Bulletin of the American Museum of Natural History, v. 135, p. 287-342.
- Stovall, J. W. and Wharton, J. B., 1936, A new species of phytosaur from Big Spring, Texas: Journal of Geology, v. 44, p. 183-192.
- Williston, S. W., 1904, Notice of some new reptiles from the Upper Trias of Wyoming: Journal of Geology, v. 12, p. 688-697.
- Wilson, J. A., 1948, A small amphibian from the Triassic of Howard County, Texas: Journal of Paleontology, v. 22, p. 359-361.