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Much uncertainty has been expressed by students of North American Triassic reptiles over the relationships and possible synonymy of the pseudosuchian genera *Typothorax* Cope (1875R), *Episcoposaurus* Cope (1887A), and *Desmatosuchus* Case (1920B). Still another genus belonging to this group, *Acompsosaurus* Mehl (1915), has been described, but its relationships to the better known forms have never been adequately determined. In the course of preparing faunal lists of the Dockum formation it was necessary to face the problem of nomenclature of these reptiles; the inadequacy of some of the early descriptions led me to examine Cope’s types (one of which had never been illustrated), and to compare these with the more complete specimens described by Case (1922B) and Sawin (1947).

From this study it is evident that the type of *Episcoposaurus haplocerus* Cope is a specimen of the large, horned genus well known as *Desmatosuchus* Case and quite unlike *E. horridus* Cope, the type of *Episcoposaurus*. *Desmatosuchus*, the type species of which becomes *D. haplocerus* (Cope), is a valid genus quite distinct from *Typothorax* Cope, which is best known from the Texas species *T. meadei* Sawin. Cope’s original type of *Episcoposaurus horridus* is hopelessly mixed with bones of other individuals, some of which were referred by him, and later by von Huene (1915A), to *Typothorax*, and which include char-
acteristic dorsal armor of that genus. Although it is not
demonstrable from the type material, the similar proportions
and size of the limb bones originally described as *Episcoposaurus
horridus* by Cope to those of *Typothorax meadei* Sawin, and
the intimate association of these bones with larger armor
plates of *Typothorax*, strongly suggests that *E. horridus* Cope
actually is a synonym of *T. coccinarum* Cope. The pelvis and
associated fragments of *Acompsosaurus wingatensis* Mehl are
clearly pseudosuchian but are not diagnostic portions for
generic identification within this Family. There is some sug­
gestion that they may belong to *Typothorax*.

Discussions of this problem with Professors C. L. Camp and
E. C. Case have stimulated this attempt to solve a persistent
taxonomic puzzle. It is a great pleasure to record the assist­
ance rendered by many colleagues in the course of this study.
Repeated opportunities to examine Cope’s types and other col­
lections from the region of Gallina, New Mexico, at the Ameri­
can Museum of Natural History have been given me by Dr.
Edwin H. Colbert, with whom I have profitably discussed many
aspects of this problem. Dr. Horace G. Richards of the Acade­
my of Natural Sciences in Philadelphia graciously permitted
me to study the type of *Episcoposaurus haplocerus* and to bor­
row portions of that specimen for illustration. Through the
kindness of Dr. E. C. Case of the University of Michigan, I have
been able to study the type of *Desmatosuchus spurensis* closely
and to benefit from his long experience collecting in the Triassic
of western Texas. Professor A. S. Romer has permitted me
to examine an undescribed skeleton of *Typothorax* in the
Museum of Comparative Zoology at Harvard. The illustrations
were prepared with great care by Miss Shirley Glaser.

Bibliographic citations correspond to those used in O. P.
Hay’s “Catalogue and Bibliography of Fossil Vertebrates of
North America.” Museum locations of specimens are abbreviated
as follows:

A.M.N.H. American Museum of Natural History, New
York City, New York

A.N.S.P. Academy of Natural Sciences, Philadelphia,
Pennsylvania
During the summer of 1874, E. D. Cope accompanied one of the parties of Lt. G. M. Wheeler's Geographical Survey west of the 100th Meridian in northwestern New Mexico (Cope 1875U). In the region of Gallina, New Mexico, he collected a few scraps of reptilian bones which he described (Cope 1875R) as *Typothorax coccinarum* Cope. Largely on the basis of these he correctly determined the age of the strata as Triassic. Cope's original description of *Typothorax* mentions in order: a fragment of a jaw which he recognized as phytosaurian; dermal scutes; part of vertebral centrum; and the head of a femur. A phytosaur tooth also was associated. A second specimen including part of the top of a skull, pitted dermal bone like the type, and a single keeled scute was doubtfully referred to the species (Cope 1875R, p. 266).

David Baldwin collected new material from the Gallina Creek locality in 1881 which formed the basis for a more detailed discussion of *Typothorax* and the description of *Episcoposaurus horridus* by Cope several years later (1887A). *Typothorax* was diagnosed on the basis of dermal plates, ribs, and femur; the jaw fragment was excluded from the type, which Cope restricted to the dermal scutes with regular round pitting, figures 4, 5, and 9 of plate 22, Cope 1877K. This emendation of the type appears perfectly valid, for the restricted type is more homogeneous than the original, yet is strictly part of it. Skin plates of large size attached to each other by matrix (Cope believed

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them fused to ribs) and a complete femur of small size from the 1881 collection were referred to *Typothorax*; but smaller, keeled dermal plates, a large and massive femur, bones of the forelimb, and some vertebrae were made the type of *Episcoposaurus horridus*. These specimens (A.M.N.H., nos. 2710-2713) are intimately mixed, partly still in matrix, the two types of dermal plates occurring together but not in original position. There is no evidence as to which limb bones are associated with each type of armor; if size is regarded as a criterion, the large femur of *Episcoposaurus* should belong with the *Typothorax* armor, and the smaller femur would be associated with the keeled plates. It is more than likely, however, that the two types of skin plates came from different parts of the same animal, and that the larger hind limb bones are associated with them. The small femora which Cope and von Huene regarded as *Typothorax* may well belong to one of the small phytosaurs which occur in the deposit, or else are those of somewhat smaller individuals of *Typothorax*. The size difference is easily accounted for on the basis of growth, the greater curvature of the shaft and twisting of the ends are harder to evaluate, for in these Triassic clays bones are frequently deformed in various ways. I do not regard the differences as proof of original diversity in form. Limb bones of M.C.Z., no. 1488, from the Ghost Ranch above Abiquiu in northwestern New Mexico are intermediate in size and similar to the "*Typothorax*" material in form. Alternatively, the large femur may be incorrectly associated, though this seems unlikely in view of Sawin's discoveries.

Von Huene redescribed and figured the material in the American Museum in 1915 (Baldwin's collection of 1881). He pointed out the difficulty of determining the association of bones and also of determining which specimens were in fact the types. By error he regarded the specimens which formed the basis of Cope's 1887 redescription of *Typothorax* as the type of that species, and included with it fragments of tibia, metatarsals, and scapula which Cope (1887A, p. 210) had regarded as of uncertain reference. Although realizing the uncertainty of association of the various dermal plates and other bones, von Huene attributed to *Typothorax* a number of small
scutes bearing conical central eminences (1915A, figs. 7-10) in addition to the flat, shallowly pitted plates. Some of these he regarded as caudal, others as lateral to the costals. (Comparison with the articulated armor of M.C.Z., no. 1488 and *Typothorax meadei* Sawin shows that they are from proximal and medial parts of the tail.) These plates are sculptured with ridges and grooves radiating outward from the central boss exactly like those which von Huene and Cope attributed to *Episcoposaurus* (cf. von Huene 1915A, fig. 24).

Von Huene rejected the association of fore and hind limbs of *Episcoposaurus* on the grounds that the bones were too disproportionate in size; he restricted the type of *E. horridus* to the large femur and referred the small forelimb bones to a mystriosuchid phytosaur, possibly "*Belodon*" *scolopax* Cope.

However, the femur of *T. meadei* is much longer and stouter than that referred to *T. coccinarum*. If Sawin's figures 7 A and B are compared with von Huene's figures 1 (*Typothorax coccinarum*) and 12 (*Episcoposaurus horridus*) it will be seen that the femur of the Texas pseudosuchian is far less curved than that attributed to *Typothorax* and much more like that of *Episcoposaurus*. Moreover the dimensions of the bones agree better with the latter genus.

Measurements in millimeters of limb bones.

<table>
<thead>
<tr>
<th></th>
<th><em>Typothorax coccinarum</em> (AMNH 2710)</th>
<th><em>Typothorax sp.?</em> (M.C.Z. 1488)</th>
<th><em>Episcoposaurus horridus</em> (AMNH 2713)</th>
<th><em>Typothorax meadei</em> (Texas 31185-84)</th>
</tr>
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<tbody>
<tr>
<td>Length femur</td>
<td>22</td>
<td>25.8</td>
<td>31.5 (est.)</td>
<td>33</td>
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<tr>
<td></td>
<td></td>
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<td>lacks condyle</td>
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<tr>
<td>Length humerus</td>
<td>.</td>
<td>17.5</td>
<td>22</td>
<td>21</td>
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<td>Length radius</td>
<td>.</td>
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<td>.</td>
<td>14</td>
</tr>
<tr>
<td>Length ulna</td>
<td>.</td>
<td>13.0</td>
<td>16.1</td>
<td>18</td>
</tr>
</tbody>
</table>
The humerus and ulna of *T. meadei* are quite similar to those belonging to the type collection of *Episcoposaurus horridus* which von Huene (1915A, p. 493, 499, figs. 25-27) rejected as too small to belong with the femur of that animal. Their proportions suggest that Cope may have been correct in his reference of the small forelimb and large femur to the same animal (*Episcoposaurus horridus*).

But the probable association of the *Episcoposaurus* femur (lectotype of *E. horridus*) with unmistakable armor of *Typothorax*, and the further likelihood that the supposed distinctive armor of *Episcoposaurus* is merely that of the tail rather than thorax or abdomen, and finally the intimate association of the type specimen of *Episcoposaurus horridus* with bones referred by Cope as well as subsequent students to *Typothorax coccinarum*, all suggest that only one species is present. If this be so (it is probably incapable of absolute proof), *Episcoposaurus* is a synonym of *Typothorax* having been established upon remains of the same species.

Smaller femora referred by von Huene to *Typothorax coccinarum* probably belong to younger individuals of that species, but in no case have any crucial bearing on the taxonomic problem as they are not primary types.

W. F. Cummins of the Second Geological Survey of Texas began explorations of northwest Texas in 1889. In 1890 he found vertebrate fossils in the Dockum formation and in 1891 collected near Dockum the specimen which Cope described as *Episcoposaurus haplocerus*. Cope himself accompanied Cummins on a collecting trip along the east side of the Staked Plains in 1892, securing additional material including fragments of pseudosuchian armor which he referred to *Typothorax* (Cope 1893A, p. 17). The thick, coarsely sculptured armor plate and large lateral horns of *E. haplocerus* are obviously so similar to *Desmatosuchus spurensis* Case as to leave no doubt of specific identity. The type localities are only a few miles apart and at about the same level in the Dockum formation.

In 1917 Professor E. C. Case of the University of Michigan discovered a pseudosuchian skeleton in Crosby County, Texas, which he described in 1920 as *Desmatosuchus spurensis*. Later
June 3, 1953  *Typothorax* and *Desmatosuchus*

Case (1929B, p. 43) suggested that *Desmatosuchus* might prove to be a synonym of *Episcoposaurus*; Sawin (1947, p. 233) was also of this opinion. This view undoubtedly arose from comparison with Cope's description of *E. haplocerus*, which is indeed the same as *Desmatosuchus*. But this animal, which will have to be known as *Desmatosuchus haplocerus* (Cope), differs widely from *Episcoposaurus horridus*, the type species of the genus *Episcoposaurus*. As has been pointed out above, the latter is probably a synonym of *Typothorax coccinarum*.

A full description of the type of *E. haplocerus* is given below, with comparisons to Case's excellent account of *Desmatosuchus*. *Desmatosuchus* differs from *Typothorax* most obviously in the coarser and unequal pitting of the dermal armor plates and in the greatly enlarged horn over the shoulder region.

In 1915 Dr. M. G. Mehl of the University of Wisconsin described the pelvis, sacrum, and other fragments of a pseudosuchian from a "red shale series near the base of the Mesozoic section" at Fort Wingate, New Mexico, and called the fossil *Acompsosaurus wingatensis*. The specimen is not readily comparable with the better known members of the group; some points in the description suggest *Typothorax*, others *Desmatosuchus*. There is no satisfactory indication that it represents a distinct genus. (I have not been able to examine this specimen.)

The extensive collections from Howard County, Texas, by the Texas Bureau of Economic Geology, W. P. A. Paleontological Survey, under the supervision of Grayson Meade in 1940 included two skeletons of a pseudosuchian described as *Typothorax meadei* by Sawin (1947). The species differs in minor details from *T. coccinarum* Cope and provides by far the most complete picture thus far obtained of the anatomy of these reptiles.

Other specimens of *Typothorax* have been obtained in eastern Arizona and northwestern New Mexico by the University of California, the Museum of Comparative Zoology, and Yale Peabody Museum, but these have contributed little toward the understanding of the family. Thus far *Desmatosuchus* has been found only in the Crosby County area of Texas.


Quadrupedal archosaurian reptiles 2½ to 3 meters long, with short, pointed heads, depressed bodies enclosed in dermal armor of overlapping bony plates, and with forelimbs much smaller than hind limbs.

Skull pointed, flat-topped, overlapped by nuchal armor; the upper temporal opening laterally situated, lateral opening low, not completely known. A large antorbital fenestra. Mandible edentulous anteriorly and possibly covered by horny beak.

Dorsal armor of two rows of overlapping plates, medial pair of plates flat, wider than long except in anterior cervical series, flat or with low conical or pyramidal eminence near center of posterior edge; lateral plates angulate with dorsal and lateral flanges meeting at sharp angle below base of projecting lateral spines; no enlarged, hornlike shoulder spines; surface of scutes covered with shallow, round, uniform sized pits about ½ cm. in diameter, except on smooth anterior articular flange and on bosses and spines which are covered with fine punctuation; armor plates relatively thin (5 to 8 mm. thick).

Ventral armor of small polygonal plates in regular rows narrower near the midline than laterally, with anterior flange for articulation with overlapping plates similar to dorsal series; pitting of ventral plates similar to dorsal armor. Tail enclosed in rings consisting of four keeled plates each rising to an angu-

2 The name Typothorax is derived from the Greek τυπος, a model or image, and ὀψαξ, breastplate, in allusion to the shallow pitting of the dermal scutes which resemble a hammered surface.
Typothorax and Desmatosuchus

Typothorax coccinarum


The trivial name coccinarum was given by Cope from the Latin coccineus, scarlet colored, referring to the red-beds from which the specimen was derived.

Cope gives no hint of the derivation of Episcoposaurus; two suggestions are possible. Latin episcopus, bishop + saurus, in allusion to the resemblance of some of the conical caudal plates to a bishop’s mitre. Alternatively, as Cope regarded the animal an ally of the phytosaurs, the literal Greek derivation emi, over + σκοτείνυ to look at + σαύρα, σαύρος, a lizard; a reptile which looks over or upward, in allusion to the high and upwardly directed orbits of phytosaurs is possible. The specific name, horridus, was derived from the Latin horrere, to bristle or tremble with dread, to be terrible.
Type: U.S.N.M., no. 2585, dermal scutes (Cope 1877K, pl. 22, figs. 4, 5, and 9.) Collected by E. D. Cope, October 5, 1874.

Type locality: "Triassic red beds of the western side of the Sierra Madre on Gallinas Creek" (Cope 1877K, p. 28). This site has been relocated by Camp (1930B, p. 143) as at Cerro Blanco, north of Gallina, New Mexico. It lies near the center of the N½ sec. 9, T. 23 N., R. 1 E. New Mexico Principal Meridian. Chinle formation, Upper Triassic.

Type of Episcoposaurus horridus: A.M.N.H., no. 2713 (formerly 2307). Two caudal vertebrae (proximal and distal); humerus; two ulnae; femur lacking condyles; proximal part of tibia; distal part of fibula; calcaneum; a number of dermal bones. Splenial possibly associated. Von Huene (1915A, p. 492-493) designated bones of hind leg as lectotype. From same locality as type of Typothorax coccinarum. Collected by David Baldwin, April 12, 1881.

The only diagnostic features of the type of Typothorax coccinarum are the thin, flat, dermal plates ornamented with numerous rather small, shallow round pits. A single keeled scute in the original collection was regarded by Cope (1875R, p. 266) as of uncertain reference. The later collection by Baldwin (A.M.N.H., nos. 2710-2713) contained both flat plates which Cope referred to Typothorax (1887A, p. 211) and keeled plates which he ascribed to Episcoposaurus (ibid. p. 216-217).

Both Cope (1887A) and von Huene (1915A) emphasized the difference in size and shape of the femora as distinctions between Typothorax and Episcoposaurus. At first sight the massive straight femur of the latter appears quite different from the small sigmoid femora attributed by Cope to Typothorax. But aside from the question of reference of these specimens, discussed on a previous page, the similar shape of the head of the two bones, and the intermediate character of the femora of Typothorax meadei Sawin and M.C.Z., no. 1488 makes reference to the same species at least reasonable. The surprisingly small forelimb of "Episcoposaurus" is now known from T. meadei to be characteristic of Typothorax, and the difference in shape and pattern of the dermal plates appears to be controlled by their location on the body; the flat plates which Cope regarded as typical of Typothorax belonging to the median
dorsal series of the back, the keeled plates of *Episcoposaurus* (fig. 17) belonging to the caudal series.

**Typothorax meadei**


Syntypes: Univ. Texas, Bur. Econ. Geol., Coll. no. 31185-84A, "fragmentary skull, a poorly preserved vertebral column, appendages, and dermal armor susceptible of reconstruction from the anterior cervical region to the proximal caudal. Associated with this specimen were numerous small dermal buttons and plates referable to the ventral and appendicular armor," and no. 31185-84B, fairly complete skull, portions of nuchal plates, fragments of dorsal plates, incomplete vertebral column, major limb bones, fragmentary remains of the girdles.

Three other specimens referred. Collected by Grayson Meade and W. P. A. Paleontological Survey, 1940.

Type locality: Univ. Texas, Bur. Econ. Geol., loc. 31185, Quarry 3A, 3 miles north of Otis Chalk, Howard Co., Texas, Dockum formation.

These specimens belong to a rather wide and flattened animal with a short pointed pseudosuchian skull, prominent, backwardly directed spines along the edge of the dorsal armor, large rear limbs and relatively weak forelimbs, and rather crocodiloid feet. Sawin (1947, p. 233) distinguished the species from *T. coccinarum* Cope on the basis of (1) pyramidal instead of conical eminences on the median dorsal plates and (2) smaller size. A further distinction between the Texas specimen and *Typothorax coccinarum* is the uniform presence of posteromesial eminences on the rear borders of the median series of plates in *T. meadei*. On *T. coccinarum* these plates are flat.

As pointed out above, the limbs have the proportions and form of those of *Episcoposaurus horridus*. Sawin's illustrations of the dorsal armor suggest a radial pattern on the median plates, and the presence of keeled bosses on these plates is distinctly more like the type of *Episcoposaurus* than that of *Typothorax*. The admixture in this animal of the supposed characters of the two genera further supports the evidence of their identity.

5 The species was named for the collector, Dr. Grayson E. Meade.
Our knowledge of the range of variation in these reptiles is far too meagre to permit a reasonable assessment of the biological validity of these species. It would be equally unwise to unite them in spite of these tangible differences or to flatly assert that the differences were unquestionably due to genetic isolation. The excellence of the *Typothorax meadei* specimens in comparison to other material of the genus is ample justification for retention of the specific name in the absence of proof of identity with another form.

*Typothorax cf. coccinarum* Cope

*Typothorax* is represented in collections of Yale Peabody Museum from the middle part of the Dockum formation west of San Jon, New Mexico. Two fragments of median dorsal plates with characteristic shallow pitting were found during the excavation of a *Machaeroprosopus gregorii* skull (along with several other specimens which could not possibly have belonged to that animal), and the fragmentary weathered remains of much of a carapace (Y.P.M., no. 3696) were collected nearby. None of these plates show any trace of a boss or tubercle on the median series. Short posteriorly directed spines at the angles of the lateral plates are suggested by a few fragments.

With grave doubts, a large thin median scute of a mid-dorsal series (Y.P.M., no. 3695) found near the same *Machaeroprosopus* skull is referred to *Typothorax* (fig. 16). Its shape and thinness suggest this genus, but the ornamentation consists of radial ridges and grooves arranged around the very low round conical boss, which lies slightly behind the middle of the plate and rises less than a millimeter above its general surface. Inasmuch as one of the typical *Typothorax* plates mentioned above was found only a few inches from this plate, and as both show the same prominent anterointernal projection one may wonder whether the difference in sculpture is anything more than an artifact of preservation and preparation. The upper surface of the peculiar scute appears damaged. It (Y.P.M., no. 3695) is generally similar to those from the Keuper of
Württemberg attributed by von Meyer (1861, pl. 43, p. 337-342) and Fraas (1896, p. 16) to *Phytosaurus kapffi*.

Rectangular median plates with similar sculpture characterize the specimen (U.M., no. 13950) from the Dockum formation on Cerita de la Cruz Creek northwest of Amarillo, Texas, which Case (1932A) referred questionably to *Phytosaurus*. Pelvis and vertebrae of that specimen are of pseudosuchian rather than phytosaurian type, as Case realized (ibid. p. 71-74); the dermal armor is more like *Typothorax* than *Desmatosuchus* and may be tentatively referred to the former.

The posterior portion of a *Typothorax* skeleton was collected from the Chinle formation at the Ghost Ranch on Canjilon Creek northwest of Abiquiu, New Mexico, by a party from Harvard University. Professor A. S. Romer most kindly permitted me to examine this specimen (M.C.Z., no. 1488; also other bones, no. 1487). It is important because the typical flat *Typothorax* plates of the body are associated with keeled scutes on the tail. Also its size is intermediate between the various specimens described by Cope as *Typothorax coccinarum* and *Episcoposaurus horridus*. The femur is 25.8 cm. long, essentially straight and stout like that of *E. horridus* but with a well developed 4th trochanter. The tibia is very broad and massive, 12.5 cm. long. Another tibia from the same locality, no. 1487, is 13.5 cm. The humerus is 17.5 cm. long to the ulnar condyle; an ulna is 13.0 cm. If my interpretation of the specimen is correct the ventral armor consists of transverse bands of plates which overlap in the same fashion as the dorsal armor, with an articular flange on the anterior external edge of each plate. Two narrow rows of plates along the midline are flanked by an uncertain number of wider scutes; all have shallow round pits like the dorsal armor, arranged in a faintly radial pattern about a central point. The latter is not raised as a boss above the surface.

Camp (1930B, p. 3) reported *Typothorax* locally abundant in the upper Chinle formation of Arizona and Utah, and rare in the lower part of that formation. Camp, Colbert, McKee, and Welles (1947, p. 4) list "*Stagonlepis,*" *Typothorax,* and *Episcoposaurus* in the Lower Chinle fauna of Arizona and Utah, and *Typothorax* in the Upper Chinle of northwestern
New Mexico. I have collected characteristic armor of the genus from the lower Chinle near St. Johns, Arizona, but am not able to determine whether early and late species can be differentiated.

**Desmatosuchus** Case


Type species by monotypy *Desmatosuchus spurensis* Case = *Episcoposaurus haplocerus* Cope.

Large quadrupedal pseudosuchians, 3 meters or more in length, with short-snouted skull, depressed body covered by heavy bony armor, the lateral plates over the shoulders prolonged into curved, hornlike spines. Limbs and feet unknown but presumably crocodiloid.

Dorsal armor distinguished from that of *Typothorax* by its greater thickness, much coarser and less regular pitting of the exposed surface, and by the great elongation of the laterodorsal spine over the shoulder.

**Desmatosuchus haplocerus** (Cope)


Wilson, J. A. 1950, p. 113-114, figs. 1-3.


Case, E. C. 1921A, p. 133-147, pl. 3 (endocast)

Case, E. C. 1922B, 26-48, figs. 7-20, pls. 5-10.

Case, E. C. 1929B, p. 50-51, fig. 21.

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6 The name is derived from the Greek δέσμα, δέσματος, a band or fetter, and σαυρός, a crocodile, in allusion to the encircling bands of armor plates. The specific name *spurensis* was given for the town of Spur, Dickens Co., Texas; *haplokerus* comes from the Greek ἁπλός, simple, and κέρας, a horn, referring to the hornlike spines of the armor plates. Professor E. C. Case tells me that he formed the name by analogy with *Desmatochelys* Williston.
Type of *D. spurensis*: U.M., no. 7476, skull; an associated skeleton belonging to the same individual includes the greater part of the vertebral column, ribs, fragments of the pelvis, and dermal armor of the back. Collected by E. C. Case in 1917 and 1919.

Type locality: Near the east bank of Blanco or Catfish River, about one-half mile east of the crossing of the old mail road from Spur to Crosbyton, Crosby County, Texas.

Type of *Episcoposaurus haploceerus* Cope: A.N.S.P., no. 14688; a sacral and two caudal vertebrae, right scapula, ribs, and about 30 dermal plates. Collected by W. F. Cummins, July 20, 1891.

Type locality: Near windmill in top pasture 3 miles north of Dockum, Dickens Co., Texas.

Distinctive characters include the short-snouted pseudosuchian skull with broad parietals and the temporal fenestrae lateral in position. It is obviously similar to, though not identical with, the skull of "*Typothorax*" meadei, which unfortunately is also difficult of interpretation in the postorbital region. The vertebrae differ from those of phytosaurs in the lower neural spines of the cervical, lumbar, and sacral regions, in the more projecting and lower parapophyses of the thoracic series, and in the somewhat lesser expansion of the dorsal ends of the neural spines in the thoracic area; the expanded tips of the spines are carried back farther than in *Machaeroprosopus*, however.

Ribs are broad, stout, with a median supporting ridge running along their internal surface.

The pelvis is imperfectly known. A referred specimen, U.M., no. 7470, has a stronger anterior process of the ilium than phytosaurs. Pseudosuchian features are shown by the glenoid region of the scapula.

Most distinctive of *Desmatosuchus* is the development of the dorsal armor with enlarged hornlike spines above the shoulder region. The armor consists of median and lateral paired plates. The median series of plates are rectangular, wider than long, and bear a smooth anterior facet over which the anterior plate moved, elsewhere they are ornamented by coarse, shallow pitting and by a median posterior raised boss. The lateral dorsal plates are angulate, extending from the median series out to the side of the back and thence downward along the flank. At the
angle, a stout spine projects outward. These spines are long in the cervical region, reach a maximum in the curved shoulder horn, and then are abruptly shorter.

It seems very likely that the ilium, U.M., no. 7322 (Case, 1922B, pl. 13A) from Sand Creek in Crosby County, Texas, and the pelvis and vertebrae, U.M., no. 7470, from the head of Holmes Creek, Crosby County, belong to *Desmatosuchus.* Case (1929B, p. 48-50) has pointed out reasons for such reference; the different form of ilium in *Typothorax meadei* (Sawin, 1947, p. 218, fig. 5A) makes confusion with this form unlikely.

Case (1929B, p. 43) and Sawin (1947, p. 233) have suggested that *Desmatosuchus* may prove to be a synonym of *Epis­coposaurus*. These statements seem to have arisen from comparisons with *E. haplocerus* Cope.

This species, attributed by Cope to his genus *Episcopo­saurus*, was based upon a dorsal and two caudal vertebrae, a right scapula, ribs, and 30 dermal plates, found by Cummins in 1891, near Dockum, Texas. Only the armor is at all comparable with the other type material. It has never been figured, although Wilson (1950) gave drawings of toptotype material (Texas Bur. Econ. Geol., no. 18569) which was supposedly part of the original specimen.

Through the kindness of Dr. Horace G. Richards of the Academy of Natural Sciences in Philadelphia, I have been permitted to examine and illustrate the type material. To one familiar with these pseudosuchians the remains are obviously so close to *Desmatosuchus spurensis* Case as to leave no doubt of specific identity. The type localities are only a few miles apart, and at about the same level in the Dockum formation.

The "single dorsal vertebra" mentioned by Cope (figs. 6, 7, 8) is a sacral, to judge by the massiveness of the rib which abuts against the side of the centrum as well as the short transverse process. Its centrum is slightly wider than tall, with moderately flaring, shallowly concave faces and an evenly rounded ventral surface without trace of keel. The neural canal was narrow and rather deeply grooved into the upper surface of the centrum in the middle position. On one side part of the heavy neural arch is preserved adjacent to the head of the sacral rib. This structure occupies the posterior half of the vertebra, and the rib facet stands out from the side of that body with smoothly curved outline. In front of it the side of the centrum is excavated, behind the flaring anterior
rim. This rim is marked by vertically elongate facets on either side which can only be interpreted as supports for the head of the expanded rib of the adjacent vertebra. Cope mentions the presence of rib facets at each end, a most unusual feature. As first sacral ribs are generally larger than the second, it seems most reasonable to assume that this is the second sacral vertebra and that these elongate facets supported the enlarged first sacral rib.

The broad centrum, absence of twin ventral keels which characterize the second sacral of *Machaeroprosopus*, (Camp, 1930B, p. 65), and the curving upper surface of the transverse process and second sacral rib, suggest *Acompsosaurus* and the specimens U. M., 13950 and 7470 described by Case (1932A, p. 67-68, figs. 5-6). Unfortunately little of the sacrum was preserved in the type of *Desmatosuchus spurensis*, but this vertebra seems to differ from those of phytosaurs in a manner similar to other parts of the column of that animal.

Two other vertebrae were considered by Cope to be caudals; one of these, which he described (1892J, p. 180), may well be a proximal caudal. Its transverse processes arise from the middle of the body of the centrum below the level of the neural canal. The ventral surface is flattened, and meets the lateral surfaces with an abrupt though rounded angle. These angular ridges terminate in facets for chevrons, as do those of phytosaurs. Anterior and posterior faces are flat or nearly so, and as Cope indicates, somewhat taller than wide.

The third vertebra in the collection, which was not described by Cope, consists of only a broken centrum, quite narrow and compressed, more like those of phytosaurs. Its association with the remainder of the specimen is questioned.

Great thickness characterizes the fragment of scapula (figs. 4, 5) which is all of the shoulder girdle preserved. Cope noted the normal inward curvature of the ventral portion, below the glenoid and acromion. However, the bone is not necessarily thinner here, as he said, for a substantial portion of the medial surface is broken away. Likewise the coracoid suture was undoubtedly more extensive than the small area preserved next to the glenoid. A prominent tubercle for the long head of the triceps muscle lies 8 cm. above the glenoid on the posterior edge of the blade. Above this the blade widens and thins, rather symmetrically. Thinness of the dorsal edge, especially anteriorly, suggests that most of the blade is preserved.

Comparison of this specimen with the fragment of the glenoid region of *Desmatosuchus* (Case 1922B, fig. 19) is difficult as there is little in common between them. The prominent acromion and thick oval base of the blade appear similar. It is also evident that the glenoid must have had something of the helical form indicated in Case’s figure. These features seem sufficient to establish the association of this kind of scapula with the more characteristic dermal plates.

Numerous features of the scapula distinguish it from that of phytosaurs, especially slight concavity of the anterior profile, the short massive blade, and the pronounced acromion process. It differs from the scapula of *Stagonolepis* (Huxley 1877, pl. x, fig. 1) in greater thickness, much greater separation of glenoid and triceps tubercle, and stronger acromion. The scapula of *Typothorax meadei* as figured by Sawin (1947, fig. 3) ap-
pears to be more expanded above, but also has a prominent acromion and triceps tubercle. These forms are by far closest to one another in characters of this bone.

The rib fragments with flattened external surface and inner convexity are quite similar to those of Desmatosuchus (Case, 1922B, fig. 14), and separable from the narrower and more rounded ribs of phytosaurs.

By far the most distinctive portions of the type of Episcoposaurus haplocerus Cope are the plates of dermal armor. Three transverse series of plates are figured herewith, and also two other isolated plates of different form. All plates are ornamented in their flatter portions by coarse, irregularly round pits up to one centimeter in diameter. The tuberosities and spines are coarsely punctate. No trace of radial arrangement of the sculpture can be detected. The plates are characterized by greater thickness than phytosaur plates of similar size, or than the plates of Typothorax. All are incomplete; the anterior and most of the posterior edges are broken away on the more anterior series so that the smooth articular flanges are not preserved; these are clearly shown by the more posterior plates.

As Cope pointed out, the plates of each transverse row were suturally united. Each row consisted of 2 pairs of plates, the median flat, the lateral, angulate and spinebearing. Both Case's reconstruction of Desmatosuchus and Sawin's of Typothorax show the median series increasing in width posteriorly to the lumbar region and then gradually decreasing. In Desmatosuchus the cervical plates are thicker than those farther back, have more nearly a right angle between the dorsal and flank portion of the lateral plates, and greater ventral development of the lateral plates. The type of E. haplocerus agrees in showing a decrease in the angle between the dorsal and flank portions of the lateral plates as the median plates increase in width, and a reduction in thickness of the median series as they increase in width. Aligning the plates on these characters gives a progressive series almost suggestive of contiguity. By far the largest lateral spine is on the most anterior of these series; accordingly the preserved portion may be compared with the 5th to 9th series of Desmatosuchus as restored by Case (1922B).

The right median and lateral plates are present in the most anterior preserved series which is that bearing the enlarged shoulder horn (figs. 1-8).

Desmatosuchus haplocerus (Cope). Type specimen of Episcoposaurus haplocerus Cope, A.N.S.P., no. 14688. All figures x ½.

Figure 1. Dorsal view posterior cervical series of dermal armor, bearing shoulder horn.

2. Median view of lateral, horn-bearing, plate of posterior cervical series, shown in figure 1.

3. Anterior view of same series as figure 1.


5. Lateral view of scapulocoracoid.

6. Left lateral view of sacral vertebra.

7. Anterior view of sacral vertebra.

8. Posterior view of sacral vertebra.
Typothorax and Desmatosuchus

1-3). The median plate is longer than wide, bears a round tubercle 1 1/2 cm. in height posterior to its center, and is strongly concave from side to side ventrally, but convex anteroposteriorly below, particularly at the sutural edges which are lenticular in outline. The right lateral plate has very little dorsal extent, and this is entirely covered by the base of the horn (fig. 3). Its flank projection is extensive, and at right angles to the dorsal part. The horn itself rises in continuity with the lateral surface of the plate, its axis sloping outward at an angle of 25° from the vertical, and its medial edge reaching the suture with the median plate. Its base is longer than wide, and slightly flattened medially. Toward the tip of the preserved portion the beginning of a backward curve is apparent.

In comparison with the large horn of the type of Desmatosuchus spuren-sis Case, this plate differs in the upward direction of the spine, and in its more rapid tapering, suggesting lesser length. Possibly these are in part due to individual variation. I am inclined to regard the angle of the horn as better established on Cope's type than in Case's specimen.

The second preserved series, which may well fall next behind the first and thus be the sixth in Case's animal, is represented by the left median plate and the conjoined right median and lateral plates (figs. 9, 10). A faint line of pores on the inner surface and of irregular small pits above mark the course of the fused suture between them. The medial plates are similar to that of the previous series save for slightly greater width. Their lenticular longitudinal section is shown in figure 11. The lateral plate, in contrast to that of the preceding series, has an obtuse angle between dorsal and flank portion, considerably greater dorsal extension, and a much smaller horn base. The lateral extent of the plate and length of horn cannot be safely inferred from the broken remains. The diameter of the horn is not greater than that in the 3rd series to be described below. This series differs from that lying behind the large horn of Desmatosuchus in retaining essentially the same thickness of plates.

An incomplete median plate and articulating horn-bearing scute (figs. 12, 13) differ from the two preceding series in the appreciably thinner bone. Dimensions of this series suggest that it could have immediately followed the one just described. The bone is appreciably thinner than in plates of the cervical series, and does not thicken greatly at the sutures. The boss and sculpture of the median plate are quite similar to those of the last (?) cervical series, but the distance from boss to lateral border of the plate is greater. Also, the boss may be closer to the posterior edge, although

Desmatosuchus haplocerus (Cope). Type specimen of Episcoposaurus haplocerus Cope, A.N.S.P., no. 14688. All figures x 1/3.

Figure 9. Anterior view of anterior thoracic series of dermal armor, consisting of paired median and right lateral plates.

10. Dorsal view of same segment as figure 9.

11. Median view of right median plate of series shown in figures 9 and 10.

12. Anterior view of a more posterior segment of the thoracic armor.

13. Dorsal view of segment shown in figure 12.

15. *Machaeroprosopus* sp. Phytosaur pelvis found near type locality of *Episcoposaurus haplocerus* by Cope in 1892. A.N.S.P. x 1/2.

This is not certain as all edges are badly broken. The lateral plate bears a short conical spine directed both upward and outward. Its anterodorsal and posterodorsal surfaces bear flattened facets in the portion preserved. The lateral flange of the plate forms almost a right angle with the dorsal portion, and appears to have been fairly extensive from the thickness of the broken edge. The suture between plates of this series is somewhat irregular, in contrast to the straight sutures between the cervical plates.

Other incomplete median plates of the dorsal region are preserved, one of which is illustrated in figure 14. These plates show a pronounced depressed flange devoid of sculpture along the anterior margin; the round conical boss lies close to the posterior edge, and the sculpture is very coarse. The thickness, away from the boss, is about 2 cm.

Included with the type of *Episcoposaurus haplocerus* is a phytosaur ilium (fig. 15) of the type figured by Case (1922B, fig. 27 C; 1927D, U.M., no. 7244). A field label accompanying it says "pelvis supposed to be *Episcoposaurus haplocerus*. Found 50 yards from type specimen. Windmill, Top Pasture. Coll.: E. D. Cope." As Cope accompanied Cummins in 1892 this must have been obtained a year later than the type. Cope did not mention it in his description of *E. haplocerus*; the


distance of 50 yards is too great to permit association with the remainder of the specimen, and its form is unlike that which has been found more intimately associated with pseudosuchian remains. The ilium probably belongs to *Machaeroprosopus* (Camp, 1930B, p. 78-79, fig. 16) which occurs abundantly in
the Dockum of this area. The length of the spine of ilium is 219 mm.

*Desmatosuchus haplocerus* differs from *Typothorax meadei* in:
1. Thicker armor plates, especially anteriorly.
2. Coarse pitting of plates with no trace of radial arrangement.
3. Tuberosities and horns rounded instead of angular.
4. Larger size.
5. Median dorsal plates have central tuberosity behind middle of plate but not reaching posterior margin.
6. Fifth lateral plate, situated over shoulder, produced into long backward curving horn.

It differs from "*Episcoposaurus horridus*" in:
1. Larger size.
2. Thicker armor plates.
3. No radial pattern to sculpture.
4. Bosses on median dorsal scutes not keel-like.
5. Probably in presence of shoulder horns.

There can be no possibility of generic identity between these forms.

**Acompsosaurus**\(^7\) Mehl, 1915


An imperfectly known genus which resembles *Desmatosuchus* in form of pelvis but has *Typothorax*-like dermal plates. Possibly a synonym of *Typothorax*.

\(^7\)The name *Acompsosaurus* is derived from the Greek αα, lacking or without, κομφος, elegant, and σαυρος, a lizard, hence a reptile lacking elegance. It was given, according to Mehl, because of the massive construction of the pelvic girdle. The species was named for Fort Wingate, New Mexico.
Acompsosaurus wingatensis Mehl


Type: Univ. Wis., no. 3811, pelvic girdle and fragments of vertebral centra, ribs, dermal plates, phalanges. Collected by M. G. Mehl and G. M. Schwartz, 1914.

Type locality: Region of Fort Wingate, New Mexico, in red shale series near base of Mesozoic section (no. 2 of section).

The pelvis is characterized by a forwardly projecting spine of the ilium, deep vertical apronlike pubis, and moderately elongate ischium. The acetabulum is imperforate. Case (1929B, p. 51-52) has pointed out its resemblance to certain pelvic remains found in the Dockum formation of Texas; there is good reason to refer these to pseudosuchian, perhaps Desmatosuchus. The associated dermal plates, some of which are closely related to the ribs like those of Typothorax, resemble that animal in lacking any trace of the keels or spines such as are found on phytosaur plates, and also in their circular pitting. The pits are also described as deep, which suggests Desmatosuchus.

Acompsosaurus may well be a synonym of Typothorax, although the poorly preserved types make such determination difficult. Its relationships, at least, appear closer to Typothorax than to Desmatosuchus, if characters of the dermal plates are regarded as significant. The form of the pelvis differs from that of Typothorax meadei, but there may be errors in Sawin's reconstruction of this region from incomplete materials. Possibly Acompsosaurus is really a third distinct type of pseudosuchian, but this seems most doubtful.

Bibliography


