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RELATIONSHIPS OF TWO CRETACEOUS LIZARDS (SAURIA, TEIIDAE)[1]

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ABSTRACT. *Peneteius aquilonius,* n. gen., n. sp., from the late Cretaceous of Montana, is a small teiid lizard with complex cheek teeth. It most closely resembles the modern South American teiids *Dicrodon* and *Teius* and also shows resemblance to the large Cretaceous teiid *Polyglyphanodon* from Utah. *Chamops segnis* Marsh, from the late Cretaceous of Wyoming, resembles the modern teiid *Callopistes maculatus. Meniscognathus altmani* Estes, from the same locality as *Chamops,* may be related to the modern teiids *Cnemidophorus* and *Kentropyx.*

These resemblances indicate that three distinct groups of primitive teiids living today in South America were in existence in North America during late Cretaceous time.

INTRODUCTION

In 1964 I described teiid lizards of modern type from the late Cretaceous Lance Formation of Wyoming. These included: (1) *Chamops segnis,* a species suggested to resemble the Recent *Crocodilurus-Tupinambis* line in dental adaptations (see below), although it differed from all other so-called "macroteiids" (Vanzolini and Valencia, 1965) by having a parietal foramen; and (2) *Meniscognathus altmani,* which bore resemblances to the *Kentropyx-Ameiva* line in both dental apparatus and externally-concave mandibles. Two other forms, (3) *Leptochamops denticulatus* and (4) *Haptosphenus placodon,* were less clearly related to modern forms.

Polyglyphanodon sternbergi, a large late Cretaceous lizard from Utah, was originally described by Gilmore (1940). In 1942 he placed it in a separate family Polyglyphanodontidae, but stated

[1] Fossil vertebrates from the late Cretaceous Hell Creek Formation, Montana: Contribution No. 2 (Contrib. No. 1 is Estes, 1965, Copeia, No. 1, pp. 90-95.)

that only tooth characters separated it from the Iguanidae. Hoffstetter (1955) was the first to note the resemblance of *Polyglyphanodon* to the teiids and in 1962 suggested that it be referred to the Teiidae. A smaller, related genus *Paraglyphanodon* was also named by Gilmore (1940, 1943). These animals are currently being restudied by Mr. William MacLean, 3rd.

A vertebrate fauna recently recovered from the late Cretaceous Hell Creek Formation, Montana, resembles that from the Lance Formation (Sloan and Van Valen, 1965; Estes, Berberian, and Meszoely, ms.). A single dentary from the Hell Creek Formation sample belongs to a teiid lizard of unusual type and is described here. I interpret this fossil as in some ways intermediate between *Polyglyphanodon* and the modern genera *Teius* and *Dicrodon*. It is probably closer to the latter genera and provides an indication that a third major living "macroteiid" line was already in existence in late Cretaceous time in North America.

ORDER SAURIA
SUBORDER SCINCOMORPHA
Family Teiidae
Peneteius aquilonius, n. gen., n. sp.

Holotype. MCZ (Museum of Comparative Zoology, Harvard University) 3612, fragmentary right dentary with four complete teeth and the bases of four others (Fig. 1).

Horizon and locality. West half section 9, T 22 N, R 43 E, McCone County, Montana; Hell Creek Formation. Collected by MCZ party in 1964.

Etymology. Latin, *pene,* almost; *aquilonius,* northern.

Diagnosis. Differs from Recent *Teius* and *Dicrodon* in having tooth crests nearly transverse, but the lateral cusp anterior to medial cusp rather than posterior. Differs from fossil genera *Paraglyphanodon* and *Polyglyphanodon* in lacking transverse expansion of tooth and in having external crests of principal cusp less well developed.

Description. Jaw fragment relatively delicate; Meckelian groove wide, indicating a large splenial; bony separation between Meckelian canal and more lateral canal (for vascular and nervous structures) set far medially, reducing depth of Meckelian groove. Teeth subacrodont, becoming molariform posteriorly; most posterior (broken) tooth evidently the largest; tooth bases subcircular, relatively thin-walled; *sulcus dentalis* absent. Tooth crowns anteroposteriorly compressed into crests; crests essentially transverse

and formed by two main cusps, the labial one relatively the higher; both cusps connected by a transverse crest. Main cusps closer together and difference in height less pronounced in more anterior teeth, but cusp axis remains transverse; crests extending anteriorly and posteriorly from main cusps, forming slight basins on each side of crown; faint depressions present lingually on each side of main lingual cusp.

Discussion. The widely-open Meckelian groove in combination with the unusual tooth crowns and heterodonty indicate relationship of *Peneteius* to the Teiidae. Closest resemblances within that family are to Recent *Dicrodon* and *Teius* from South America

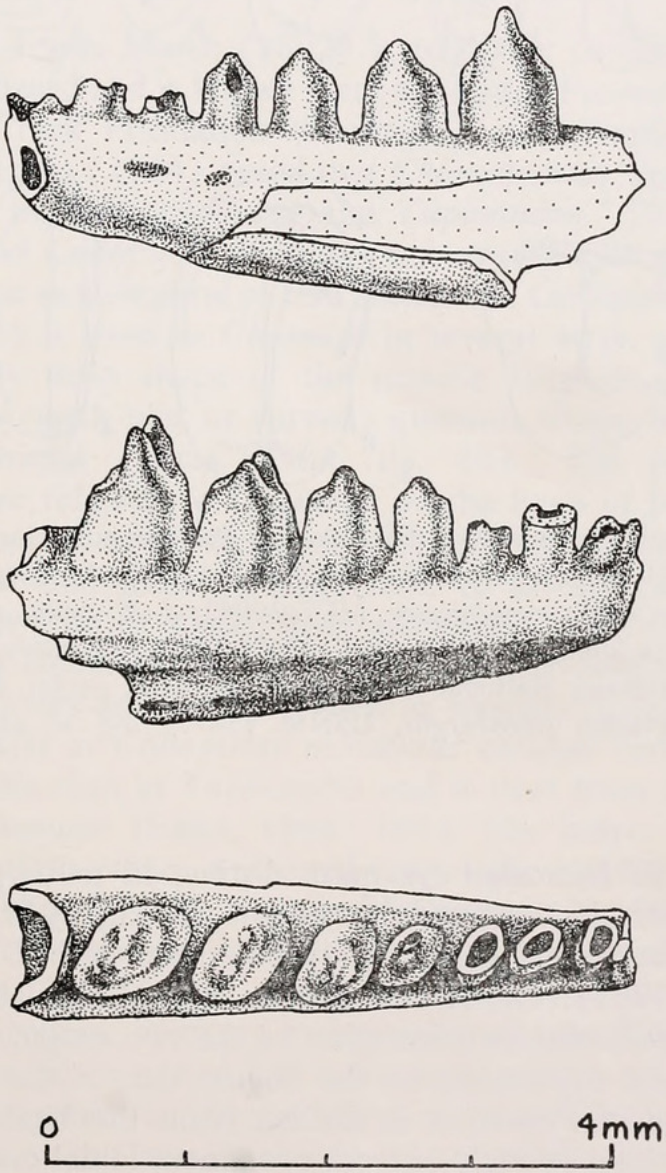

Fig. 1. *Peneteius aquilonius,* n. gen., n. sp., MCZ 3612; *a,* labial, *b,* lingual, *c,* occlusal view of fragmentary left dentary.

and the fossil *Paraglyphanodon* and *Polyglyphanodon* from the Cretaceous of Utah. *Paraglyphanodon* is the smaller of the two fossil genera. Teeth of the two described species *P. utahensis* and *P. gazini* show a morphological series that could lead to the strongly transverse, crested tooth condition seen in *Polyglyphanodon,* and it is possible that *Paraglyphanodon* is only a small individual or the young of the former. The most complex and cuspate teeth in any Recent teiid occur in *Teius teyou;* Figure 2 shows occlusal views of teeth of pertinent living and fossil species. The

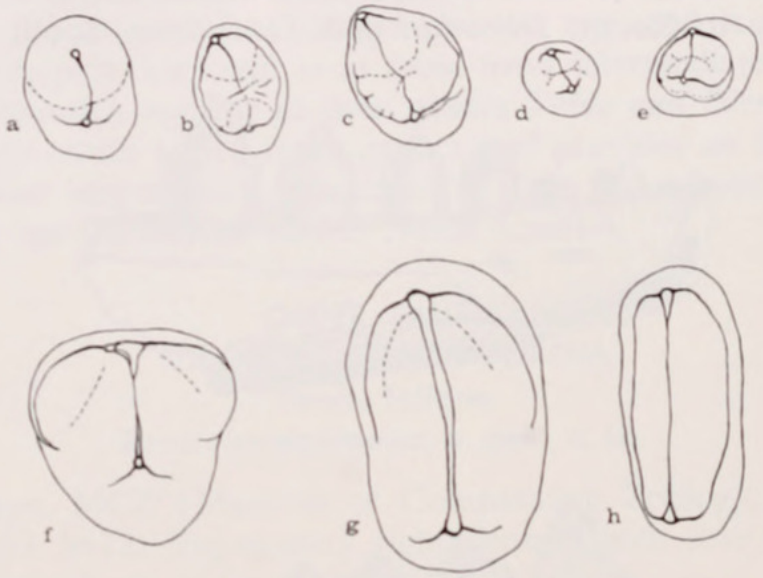

Fig. 2. Crown patterns of teiid teeth. All are posterior teeth of left dentaries. *a, Dicrodon guttulatum,* MCZ 111415; *b, D. heterolepis,* MCZ 12329; *c, Teius teyou cyanogaster,* MCZ 39982; *d, T. teyou,* MCZ 43351b; *e, Peneteius aquilonius,* n. gen., n. sp., MCZ 3612; *f, Paraglyphanodon utahensis,* United States National Museum 15668; *g, P. gazini,* USNM 16580; *h, Polyglyphanodon sternberghi,* USNM 15477. *a-g* × about 16, *h* × about 9.

two species of *Dicrodon* are quite distinct in tooth patterns and in many other characteristics as well (Schmidt, 1957); Schmidt's species *D. holmbergi* has been synonymized with *D. guttulatum* by Fugler (1967). The Recent species figured here all differ from *Peneteius aquilonius* in orientation of the two major cusps and in lacking a faint depression on the lingual side of the crown. The tooth pattern of *Peneteius* is distinct from the Utah Cretaceous genera in lacking strongly-curved, prominent labial crests that may (*Polyglyphanodon*) or may not (*Paraglyphanodon*) connect with the secondary cusp. Resemblances are shown to the modern genera

in the latter character, especially to *Teius teyou* and *Dicrodon heterolepis*. Additional similarities with the former are the apparently small number and relatively large size of the teeth. The basin-crest structure on tooth crowns of Recent species and *Peneteius* recalls anterior teeth of *Paraglyphanodon* (Gilmore, 1942, fig. 22), but the similarity is not great. However, resemblance to the Utah Cretaceous forms is shown in the more transverse rather than oblique orientation of the tooth cusps. Restudy of the Utah fossil forms must precede further speculation on the affinities of *Peneteius*.

THE RELATIONSHIPS OF CHAMOPS

Chamops segnis Marsh (1892) is relatively common for a late Cretaceous lizard and is known from the Lance Formation (Wyoming), Hell Creek Formation (Montana), and Wapiti Formation (Alberta). Estes (1964) noted that *Chamops* was "quite probably ancestral to both *Crocodilurus* and *Tupinambis*." Comparison of *Chamops* and *Callopistes* (a genus not available to me in 1964) requires some modification of that statement. *Callopistes maculatus* (MCZ 2751) is close to *Chamops* in several ways, principally in the relatively deep shape of the maxilla (Fig. 3c,d), the more normal (less conch-like, or curved) quadrate shape, and relatively elongate parietal (Estes, 1964, fig. 49). The parietals and quadrates are referred to *Chamops* on the basis of both size and frequency, as well as on their generally teiid appearance; *Chamops* is the largest and most common teiid in the Lance Formation.

The tooth row of *Callopistes maculatus* is more heterodont than that of *Chamops* and fewer teeth are tricuspid; I interpret both heterodonty and bicuspid teeth as specialized features. However, the nasal in *Callopistes maculatus* extends further forward on the maxilla than in *Tupinambis* and is thus more like the condition in *Chamops* (Estes, 1964: 107). The latter, *Tupinambis*, and *C. maculatus* share a pointed lateral premaxillary process of the maxilla (Fig. 3). The dentary of *Chamops* is relatively deeper than that of *Tupinambis* of equal size and resembles the proportions seen in *C. maculatus*. Tooth number is essentially the same in all these genera, contrary to my statement in 1964 (p. 107), which was based on only a few individuals.

Facial elongation is characteristic of many "macroteiids" and is most extreme in *Cnemidophorus*. The latter does not differ from *Ameiva* in facial elongation, although I so stated in 1964 (p. 108); examination of a large series shows considerable size variation in

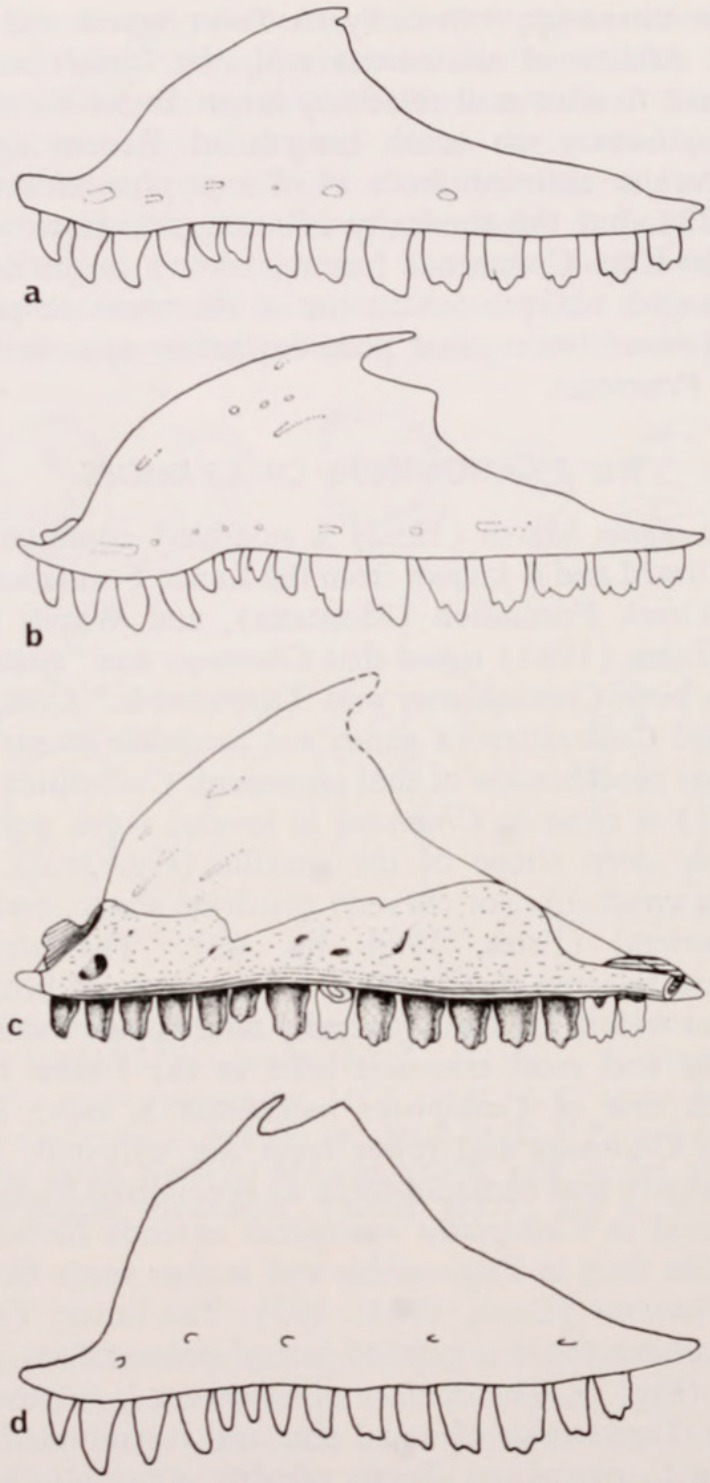

Fig. 3. *a, Crocodilurus lacertinus,* American Museum of Natural History 46290; *b, Tupinambis nigropunctatus,* Los Angeles County Museum R-74; *c, Chamops segnis,* University of California Museum of Paleontology 46033, restored dorsally from UCMP 46094 and other specimens; *d, Callopistes maculatus,* MCZ 2751; not to scale, all reduced to a common length.

this character and the two genera are probably synonymous, as indicated by recent studies (Gorman, pers. comm. and ms. 1968). *Tupinambis nigropunctatus* and *Callopistes maculatus* of equal size show the former slightly exceeding the latter in facial length; *Crocodilurus* resembles the latter. *Kentropyx calcaratus* resembles *Cnemidophorus* in this feature; my statement to the contrary in 1964 (p. 108) was based on a misidentified skeleton.

In summary, the Recent *Callopistes maculatus* appears to be the closest relative of *Chamops segnis*. *Tupinambis nigropunctatus* is the most primitive member of that genus and is close to *Chamops* but appears more advanced than the latter and *Callopistes* in a number of features. The maxilla of *Crocodilurus* is relatively less high than that of *Chamops* and the former seems to be less closely related to the latter than it is to *Tupinambis*.

CONCLUSIONS

Current study of "macroteiids" by Gorman, Presch, MacLean, and myself is in general agreement with Vanzolini and Valencia (1965) in separating two major subgroups: one including *Callopistes, Tupinambis, Crocodilurus,* and *Dracaena;* the other formed of *Ameiva, Cnemidophorus, Kentropyx, Teius,* and *Dicrodon*. The latter two genera possess distinctive, crested, cuspate cheek teeth. *Peneteius aquilonius,* n. gen., n. sp., from the late Cretaceous of Montana, has similar teeth and is probably related to the Recent *Teius-Dicrodon* line. *Chamops segnis,* from the late Cretaceous of Wyoming, Montana, and Alberta, appears to be related to the Recent species *Callopistes maculatus*. The latter two species are probably more primitive, on the basis of high maxilla and less well-developed heterodonty, than are *Tupinambis, Crocodilurus,* or *Dracaena*. With the possible relationship noted above of the fossil genus *Meniscognathus* to the *Ameiva-Kentropyx* group, it thus appears that three distinct groups of "macroteiids" living today in South America were in existence in North America during late Cretaceous time.

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