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(*Continued from 3d page of cover.*)

Vol. XI. Anthropology.

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ETHNOGRAPHICAL ALBUM.

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ERRATA.

Page 420, explanation of Fig. 8, for *Hyænodon brachygnathus* read *Hyænodon brachycephalus.*

" 422, in explanation of Fig. 9 E, omit the word type.

" " explanation of Fig. 9 G, for *Hyænodon brachygnathus* read *Hyænodon brachycephalus*, type.

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SPECIES AND SUBSPECIES.

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Article I.— OBSERVATIONS UPON THE GENUS ANCODON.

BY W. D. MATTHEW.

1. DESCRIPTION OF A NEW SPECIES FROM THE LOWER MIOCENE.

Ancodon (? = Bothriodon) leptodus sp. nov.

The genus *Ancodon* (*Bothriodon* or *Hyopotamus*) is characteristic of the Oligocene and Upper Eocene of Europe and Africa and of the Oligocene (White River group) in this country. It is also recorded in the Siwalik fauna of India. It has not been found in the uppermost Oligocene (John Day formation) in America, but the three faunal horizons of the White River have yielded three species well distinguished from each other and from any of the Old World species. These are:

A. brachyrhynchus (Osborn and Wortman 1894). Protoceras Beds.

A. rostratus Scott 1894. Oreodon Beds.

A. americanus (Leidy 1856). Titanotherium Beds.

In certain respects these species appear to be in direct succession; in others they do not. They show a progressive shortening of the muzzle accompanied by a slight decrease in size of the cheek teeth, the size of the skulls varying widely in each species. On the other hand the first upper premolar is small in *A. americanus*, absent in *A. rostratus*, but quite well developed in *A. brachyrhynchus*.

The American Museum Expedition of 1906 obtained an incomplete skull with lower jaws and parts of skeleton (No. 13005) of an *Ancodon*, from the Lower Rosebud beds which overlie the White River on the Pine Ridge Reservation in South Dakota. These beds constitute the lowest

member of the Arickaree formation in that locality and are referred from their fauna to the Lower Miocene (Matthew, 1907).

This specimen represents a fourth American species allied to *A. brachyrhynchus,* but with the muzzle somewhat shorter and the cheek teeth smaller. All the premolars are somewhat smaller and considerably more compressed, the inner crescents of the upper series and internal ridges of the lower series less developed. The inner ridge is absent upon p_1, rudimentary upon p_2, incomplete upon p_3 and apparently incomplete upon p_4. In *A. brachyrhynchus* it is rudimentary upon p_1, complete upon p_2, p_3 and p_4. The lower molars are decidedly narrower, but the heel of m_3 is broader. The upper molars are smaller and have no trace of the internal cingula which are present but incomplete in *A. brachyrhynchus.* The diastema between c_1 and p_1 is about half as long as that between p_1 and p_2; in *A. brachyrhynchus* these diastemata are subequal. The species differs from *A. rostratus* and *A. americanus* in the much shorter muzzle and well developed two rooted p^1 in addition to the characters above cited. Among the European species, *A. velaunus* and *leptorhynchus* of the Lower Oligocene have long slender muzzles like the Middle and Lower Oligocene American species, with which they correspond in the cheek teeth except for slightly smaller size, spacing of p^1 and other minor characters. *A. borbonicus* and *porcinus* of the Middle Oligocene appear to have short muzzles as in *A. brachyrhynchus* and *leptodus,* but are smaller, especially *A. porcinus,* and are very imperfectly known, so that exact comparison is difficult. The Upper Eocene species *A. crispus* and *gresslyi* are much smaller with very short-crowned teeth and other points of difference, so that they are now regarded as a distinct genus (*Tapinodon*). *A. gorringei* and *parvus* of the Upper Eocene of Egypt are like *A. velaunus* except for smaller size and more brachydont teeth.

The portions of the skeleton preserved in the type of *A. leptodus* are three cervical vertebræ, the last five lumbars, sacrum, pelvis, calcaneum and navicular. They add very little to what is already known of the osteology of the genus as given by Scott in 1894. The posterior lumbars are remarkable for the unusually long neural spines, projecting strongly forward and decreasing in width to the tip. This is quite different from the type of spine on a lumbar vertebra referred by Andrews (1906) to this genus; but as Andrews's specimen appears to be an anterior lumbar, it may be that the character of the spines changes anteriorly. The zygapophyses are slightly revolute on the first and last two of the series of five lumbars, but not on the intermediate ones. The sacrum consists of three vertebræ, of which the first chiefly supports the pelvis, the second contributing to but a slight extent to the articulating surface. It is relatively

short and wide, the second and third vertebræ much reduced — more so than in *Sus*. The pelvis resembles that of *Sus* much more than it does any of the Oreodontidæ, and corresponds quite nearly to the pelvis of *A. gorringei* figured by Andrews.

The characters of lumbars, pelvis, and foot-bones in *Ancodon* indicate to my mind a much nearer relationship to the Suidæ than to the Oreodontidæ.

2. Distribution of Ancodon and Related Genera.

The distribution of the known species of *Ancodon* and the related genera *Tapinodon, Arretotherium* and *Merycopotamus* is as follows:

	Europe.[2]	Africa.	Asia.	N. America.
Upper Miocene			Merycopotamus. A. giganteus,[1] etc	
Middle "				
Lower "				Arretotherium. A. leptodus.
Upper Oligocene				A. brachyrhynchus.
Middle "	A. borbonicus.[4] A. porcinus.			A. rostratus.
Lower "	A. velaunus.[5] A. leptorhynchus, etc.			A. americanus.
Upper Eocene	? A. crispus.[6]	A. gorringei.[3] A. parvus.		
Middle "	Tapinodon.[7]			

From the above table it will appear that while ancestral forms of *Ancodon* occur in the Upper and Middle Eocene of Europe, none are recognized in the American Eocene. The genus is common in the uppermost Eocene of

[1] Lower Siwalik (Bugti beds) of India.

[2] The horizons of the European species are correlated auct. Depéret, 1908.

[3] Fluvio-marine beds of the Fayum, Egypt. Regarded by some authorities as Lower Oligocene.

[4] These species are from St. Pourçain-sur-Bebre and Digoin in the basin of the Loire.

[5] These species are from Ronzon, France, and Hempstead, Isle of Wight (*A. bovinus*, etc.).

[6] St. Euzet-les-Bains (Gard.), France.

[7] Egerkingen, Switzerland, *T. gresslyi* et al.; also Mauremont.

Africa, but no predecessors are found there in the fauna of the underlying beds. As has been seen, the American species are apparently not in absolutely direct genetic sequence although nearly so. They occur in four successive levels in the same region, and their geological sequence is beyond question. All of them are known from fairly complete material — skulls, jaws and more or less of the skeleton. The species of the European Oligocene appear to parallel those of the American Oligocene in their evolution, but to be somewhat more advanced at corresponding epochs. The African species are most nearly related to those of the European Lower Oligocene but somewhat more primitive. The species of the European Eocene are much more primitive, but imperfectly known so that we cannot be sure whether they are directly ancestral or not. We know nothing of the presence or absence of the genus in Asia during the early Tertiary, unless some of the species which have been referred to the Siwalik fauna belong to older faunæ, possibly as far back as the Oligocene.

On present evidence we must regard the genus as of Old World origin, probably not African, possibly European, but considering the relative advancement and geological position of the European and African species, more probably of Asiatic origin. We may suppose that from a diffusion center in Northern Asia early stages in the evolution of the phylum reached Europe in the Middle and Upper Eocene. More advanced forms migrated to Africa near the end of the Eocene, and to Europe and North America at the beginning of the Oligocene. In Europe they became somewhat modified but disappeared with the close of the Middle Oligocene. In North America they evolved longer upon parallel lines, *Arretotherium* being probably the final stage of their evolution. They presumably became extinct in northern Asia early in the Oligocene (since none of them accompany any later migration from this center) but spread southward to India, where their survivors and modified descendants (*Merycopotamus*) existed until the late Miocene.

The latest member of the phylum, *Merycopotamus*, is distinguished by the loss of the fifth cusp on the molars, and the assumption of a hippopotamoid type of skull, with wide flaring muzzle and powerful canines. *Arretotherium* in North America represents a corresponding but less specialized type. It has lost the fifth cusp on the molars but is otherwise very like *Ancodon* and especially *A. leptodus*, in which the fifth cusp was apparently present, although the wear of the teeth in the type specimen prevents me from determining whether it was well developed or not. Mr. Douglass regards the beds in which *Arretotherium* was found as Oligocene, but they may quite as well be Lower Miocene. The only accompanying fossils were the back of the skull of a rhinoceros, referred to *Cœnopus*, and the lower jaw of a species of *Steneofiber*, *S. hesperus* Douglass. *Cœnopus* ranges from

Lower Oligocene to Lower Miocene or later, *Steneofiber* from Upper Oligocene to Lower Miocene (doubtfully later). *S. hesperus* is closely allied to the Lower Miocene species, especially to *S. montanus* Scott.

3. Comparative Measurements of the American Species.

I append a table of comparative measurements taken from the following specimens:

A. americanus Leidy.

(1) Type (Phila. Acad. Coll.). Measurements taken from Leidy's figures.

(2) No. 11867 Am. Mus. Coll., a finely preserved skull from the Lower Titanotherium Beds, found by H. F. Wells.

A. rostratus Scott.

(1) Type (Princeton Mus. Coll.). Measurements given by Scott, 1894.

(2) No. 575 Am. Mus. Coll., incomplete skull figured by Osborn and Wortman as *A. americanus* but referred by Scott to *A. rostratus*.

A. brachyrhynchus Osborn and Wortman.

(1) Type, No. 582, Am. Mus. Coll., skull lacking premaxillæ and canines.

(2) No. 10650, Princeton Coll., skull, jaws and part of skeleton (measurements from Scott, 1894).

(3) No. 583 Am. Mus. Coll., lower jaws.

A series of skulls of *A. brachyrhynchus* in the American Museum collection from the same horizon and locality as the type, agree fairly well in measurements of teeth, but show a wide range of variation in size and robustness of skull. Corresponding variability is observed in skulls of modern pigs, and it is probably not of specific value.

A. leptodus sp. nov. supra.

(1) Type, No. 13005 Am. Mus. Coll., described above.

	A. americanus.		A. rostratus.		A. brachyrhynchus.			A. leptodus.
	Type.	A. M. No. 11867	Type.	A. M. No. 575	Type.	Princeton No. 10650	A. M. No. 583	Type.
Skull, extreme length	—	493	451	—	—	338	—	323[1]
Upper dentition, i^1–m^3	—	303	—	242	205[1]	—	—	201[1]
" cheek teeth p^1–m^3	—	154	120	124	134	125	—	121
" true molars m^{1-3}	76	81	71	76	73	63	—	66

[1] Premaxilla and incisors estimated.

	A. americanus.		A. rostratus.		A. brachyrhynchus.			A. leptodus.
	Type.	A. M. No. 11967	Type.	A. M. No. 575	Type.	Princeton No. 10650	A. M. No. 583	Type.
Post canine diastema	—	70	90	66	19	—	—	23
P^3, transverse diameter	18	17	—	—	17	—	—	14
" antero-posterior diam.	18	17	—	—	17	—	—	16
M^3, transverse diameter	31.5	33	—	30	30	—	—	29
Lower jaw, total length	—	—	—	—	—	302	320[2]	293[2]
" dentition i_1–m_3	—	—	—	—	—	—	203[2]	200[2]
" cheek teeth, p_2–m_3	—	—	132	—	—	—	126	123
" true molars m_{1-3}	—	—	82	—	—	78	78	74
Diastema behind c_1	—	—	22	—	—	—	18	10
" " p_1	—	—	55	—	—	—	19	20
P_3, transverse diameter	—	—	—	—	—	—	9	8
" anteroposterior diam.	—	—	—	—	—	—	17	16
M_3, transverse diameter	17.5	—	—	—	—	—	18	16
" anteroposterior diam.	—	—	—	—	—	—	36	36
" transv. diam. of heel	—	—	—	—	—	—	9	12

4. Synonymy of the Genus and of the American Species.

Hyopotamus Owen 1848, and *Ancodon* Pomel 1847, are the names in common use. The former is preoccupied by *Hyopotamus* Kaup 1844, a genus of supposed Hippopotamidæ not now recognized. Both names are probably antedated by *Bothriodon* Aymard 1846 (see Bush, 1903, Andrews, 1906). As there appears from Dr. Andrews's statement to be still much uncertainty as to the date of Aymard's genus, I follow his example in retaining *Ancodon* for the present. Besides the four American species which have been considered valid, three others have been proposed by Professor Marsh.

Hyopotamus deflectus Marsh 1890, is regarded by Scott as a synonym of *Ancodon americanus*, and comes from the same horizon and locality. Dr. Hay in his 'Catalogue' has indorsed this opinion. I have not seen the type, an incomplete skull in the Museum of Yale University.

Heptacodon armatus Marsh 1894, subsequently made the type of *Elomeryx* Marsh 1894, is based upon a worn upper molar of an Anthracotheriid from the Protoceras Beds. I formerly (1899) placed it along with the type species of *Heptacodon* (*H. curtus* Marsh) in the genus *Anthracotherium*. A more careful study of Marsh's figure of the type specimen convinces me

[2] Incisors estimated.

that it is more probably a species of *Ancodon*. It is quite likely the same as *A. brachyrhynchus*, which it antedates, but it is at present indeterminate and I set it aside as such.

Elomeryx mitis Marsh 1894, also from the Protoceras beds, is based upon three worn upper molars which appear to belong to the milk dentition. It is referable to *Ancodon* and is quite likely identical with *A. brachyrhynchus*, which it antedates by a few days, but it is also, in my opinion, specifically indeterminate, and may be set aside as such.

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