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ART. VIII.—*Two New Forms of Agriochærus*; by MALCOLM RUTHERFORD THORPE.

[Contributions from the Othniel Charles Marsh Publication Fund, Peabody Museum, Yale University, New Haven, Conn.]

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INTRODUCTION.

The genus *Agriochærus* has approximately as many synonyms as have the Chalicotheres. In 1850, Leidy described the first form as *A. antiquus* from the badlands of Nebraska. Other genera proposed since that time and now regarded as synonymous are: *Eucrotaphus* Leidy 1852, *Coloreodon* Cope 1879, *Merycopater* Cope 1879, *Artionyx* Osborn and Wortman 1893, and *Agriomeryx* Marsh 1894.

*Coloreodon* and *Agriomeryx* were based on the presence of three instead of four superior premolars, while *Artionyx* was established on a pes and a portion of hind leg. *Artionyx* was the basis for a new suborder, Artionychia. Skeletal elements have been referred to no fewer than three mammalian orders, and the peculiarities of structure exhibited by this genus have given rise to much speculation in regard to its taxonomy and life habits.

The writer's reasons for placing *Eucrotaphus* in the genus now under consideration will be more fully set forth in a subsequent paper, based chiefly upon Leidy's descriptions and the work of contemporaneous and subsequent students.

The former method of classification of the species on a basis of the possession of either three or four superior premolars has proved unreliable. However, the later forms usually have but three superior premolars. The osteology of this genus and its affinities have been very ably described and discussed in the papers cited in the list of references. The illustrations for the present paper were made by Mr. Rudolf Weber.

#### WHITE RIVER SPECIES.

##### *Agriochærus antiquus antiquus* Leidy 1850.

Middle Oligocene (lower Brule), bad lands, Nebraska.

*Specific characters.*—Skull approximately the size of *Oreodon culbertsonii*; orbits subrotund; infra-orbital foramen above interval between P<sup>3</sup> and P<sup>4</sup>; anterior part of palate strongly uparched; external buttresses of molars hemispherical; no internal cingulum on M<sup>3</sup>; postero-internal lobe of P<sup>4</sup> very small; P<sup>3</sup> right triangular; P<sup>4</sup> molari-form but with anterior internal wall incomplete; muzzle long and narrow; bullæ moderately large; superior premolars always four; inferior incisors three, but very small.

Several specimens in the Marsh Collection have served for amplification of this type, especially Nos. 12657 and 12666, Y. P. M.

#### *Measurements.*

Breadth of forehead at postorbital processes (holotype) . . .	mm. 59.2
Superior molar series, length (No. 12657, Y. P. M.) . . . . .	47

Inferior dental series with $P_1$ , length (No. 12666, Y. P. M.)	104
Inferior molar series, length (No. 12666, Y. P. M.)	53
Inferior premolar series, length (No. 12666, Y. P. M.)	27
Depth of ramus below middle of $M_3$ (No. 12666, Y. P. M.)	44.5
Depth of ramus below middle of $P_3$ (No. 12666, Y. P. M.)	32

*Agriochærus antiquus dakotensis*, subsp. nov.

(FIG. 1.)

Holotype (skull), Cat. No. 10106, Y. P. M.; paratype (jaws), Cat. No. 12665, Y. P. M. Middle Oligocene (lower Brule), South Dakota.

*Specific characters*.—Skull approximately the size of *A. antiquus antiquus*; palate more steeply uparched, especially between the premolars;  $P^4$  rotated forward and set obliquely in maxilla;  $P^3$  almost an equilateral triangle in basal outline; infra-orbital foramen above interval between  $P^2$  and  $P^3$ ; four superior premolars. The bullæ extend forward to the glenoid surface and but slightly below it. They are in contact with the postglenoid

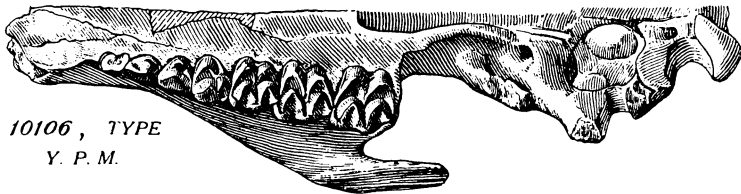


FIG. 1.—*Agriochærus antiquus dakotensis*, subsp. nov. Holotype. Right half, palatal view. Basal outline of bulla drawn from opposite side.  $\times 1/2$ .

tubercle and paramastoid process as well as the glenoid articular surface. Superior contour of skull nearly straight, the muzzle being of the same depth as the cranium; orbits small and round; an osseous ridge, depending from the squamosal and parietal bones, and extending from the glenoid articular surfaces to the pterygoid processes, encloses a basicranial depression. This peculiarity I have not seen in any other species. The sagittal crest is moderately long.

*Measurements of Holotype.*

	mm.
Skull, length, occip. condyles to incisors, inc.....	197*
Bizygomatic diameter .....	103*
Brain-case, max. width .....	61
Superior dental series, with C, length.....	106
Superior molar series, length.....	43
Inferior molar series, length (No. 12665, Y. P. M.).....	47.2
Inferior premolar series, length (No. 12665, Y. P. M.)....	38.7

\* Approximate.

*Agriochærus migrans* (Marsh) 1894.

<sup>1</sup>Holotype, Cat. No. 10102, Y. P. M. Upper Oligocene (Protoceras beds), South Dakota.

*Specific characters.*—Skull somewhat longer than *A. latifrons*; deep frontal fossæ immediately anterior to the junction of the temporal ridges; the latter are very short and originate about midway between their junction and the postorbital processes; palate gently concave; three superior premolars; muzzle moderately short; infra-orbital foramen over posterior part of P<sup>3</sup>; marked concavity above and below canine convexity; anterior zygoma massive, with a prominent ridge; trending outward and downward above M<sup>3</sup>; orbits look upward and outward; forehead flat; nasal bones flat and extend to a line above the anterior margin of the canines; prominent sagittal crest; palatonarial border pointed, the apex being opposite the middle of M<sup>3</sup>; pterygoid processes robust; prominent convexity near nasion on a line between the anterior margins of the orbits.

The above description is much more detailed than the original one by Marsh in 1894, and is the only amplification of this well marked species since that date.

*Measurements of Holotype.*

	mm.
Skull, estimated length, occip. condyles to incisors, inc.....	235
Bizygomatic diameter .....	128
Superior dental series, with C, length.....	110
Superior dental series, without C, length.....	70.8
Superior molar series, length .....	45
Diastema between C and P <sup>2</sup> , length.....	31

JOHN DAY BASIN SPECIES.

*Agriochærus bullatus*, sp. nov.

(FIGS. 2-4.)

Holotype, Cat. No. 12424, Y. P. M. Upper Oligocene (upper John Day), Turtle Cove, John Day River, Oregon.

The type material consists of the skull only, with the portion anterior to P<sup>2</sup> carried away. It is a submature individual, but with permanent dentition.

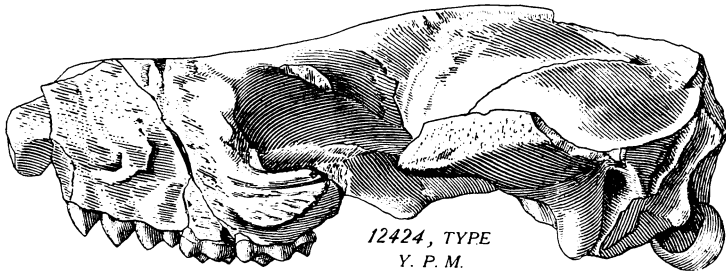


FIG. 2.—*Agriochærus bullatus*, sp. nov. Holotype. Left lateral view.  $\times 3/5$ .

*Specific characters*.—Skull mesocephalic; infra-orbital foramen above middle of P<sup>3</sup>; nasal bones wide, flat, and obtuse posteriorly, as in *Oreodon gracilis*; orbits proportionally smaller than in any other species; sagittal crest

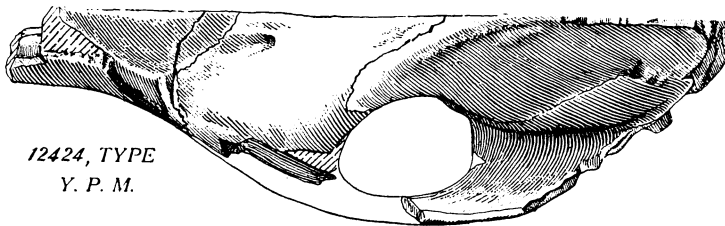


FIG. 3.—*Agriochærus bullatus*, sp. nov. Holotype. Left half, superior view.  $\times 3/5$ .

low and relatively short; shallow concavity between temporal ridges anterior to their junction; temporal ridges short, beginning well posterior to orbits; palate steeply inclined to sagittal suture, with a cross-section like an inverted V; palatonarial border opposite posterior lobe of

M<sup>2</sup> (in adult this would probably be farther back); basicranial axis shallow; paroccipitals plate-like and standing at an angle of about 45° to the sagittal plane; postglenoid robust; basisphenoid nearly flat between bullæ; infero-anterior termination of occipital condyles extends forward below basisphenoid in the shape of a shelf; bulla has a flat, nearly vertical surface facing inward and backward, joining the paroccipital process; antero-externally a ridge runs forward and inward

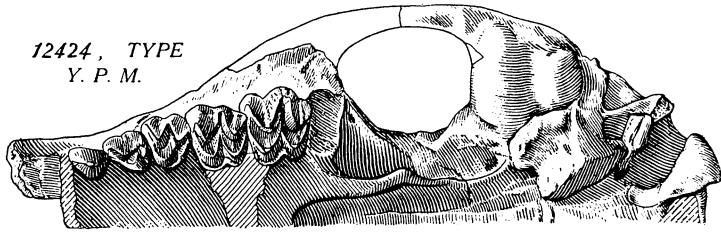


FIG. 4.—*Agriochærus bullatus*, sp. nov. Holotype. Left half, palatal view.  $\times 3/5$ .

beyond the middle of the glenoid articular surface; inferior surface of bulla keeled, the keel running transversely from the postglenoid tubercle, with which it is in contact, to the lower border of the internal plane face; long axis of bulla lies at about a 35-degree angle from the sagittal plane, the anterior portion approaching the pterygoid process, a form of bulla which does not occur in any other species of this genus.

*Measurements.*

	mm.
Skull, total length, occip. condyles to C, inc.....	175*
Bizygomatic diameter .....	102
Diameter of postorbital constriction.....	39
Dentition, P <sup>2</sup> to M <sup>2</sup> , inc., length.....	57
M <sup>2</sup> + M <sup>1</sup> , length .....	29
Brain-case, max. diameter.....	58

\* Approximate.

SYNOPSIS OF SPECIES.

1. Infraorbital foramen above interval between P<sup>2</sup> and P<sup>3</sup>.  
Size about that of *Oreodon culbertsonii*; bullæ small; palate very steeply uparched; palatonarial border oppo-

site anterior lobe of  $M^3$ ; nasals pointed posteriorly; four superior premolars. Middle Oligocene (lower Brule) ..... *A. antiquus dakotensis*, subsp. nov.

About same size as above; bullæ large; palate gently concave; palatonarial border opposite anterior part of  $M^3$ ; nasals acute posteriorly; four superior premolars. Upper Oligocene (middle and upper John Day).

*A. trifrons* Cope.

Skull size of second above; bullæ small; palate gently concave; palatonarial border opposite posterior lobe of  $M^2$ ; nasals blunt posteriorly; three superior premolars. Upper Oligocene (middle and upper John Day).

*A. ferox* (Cope).

2. Infraorbital foramen above anterior lobe of  $P^3$ .

Skull about size of *Eporeodon major*; bullæ large and medially constricted; palate strongly concave; palatonarial border acute and opposite middle of  $M^3$ ; nasals broadly rounded posteriorly; four superior premolars. Upper Oligocene (middle John Day).

*A. ryderanus* Cope.

3. Infraorbital foramen above middle of  $P^3$ .

Somewhat larger than *O. culbertsonii*; bullæ large; palate flat; internal wall of  $P^4$  complete; either three or four superior premolars. Middle Oligocene (lower Brule) ..... *A. latifrons* Leidy.

Skull about size of that of *Eporeodon major*; bullæ unknown; palate nearly flat; palatonarial border opposite posterior part of  $M^3$ ; nasals rounded posteriorly; three superior premolars. Upper Oligocene (middle and upper John Day) ..... *A. macrocephalus* (Cope).

Size about that of *O. culbertsonii*; bullæ moderately large and inferiorly keeled in transverse plane; palate steeply inclined; palatonarial border opposite anterior part of  $M^3$ ; nasals obtuse posteriorly; three superior premolars. Upper Oligocene (upper John Day).

*A. bullatus*, sp. nov.

4. Infraorbital foramen above posterior part of  $P^3$ .

Skull about size of second above; bullæ unknown; palate gently concave; palatonarial border opposite middle of  $M^3$ ; nasals rounded posteriorly; three superior premolars. Upper Oligocene (Protoceras beds).

*A. migrans* (Marsh).

5. Infraorbital foramen above interval between  $P^3$  and  $P^4$ .

Size slightly greater than *O. culbertsonii*; bullæ moderately inflated; palate strongly uparched anteriorly; internal wall of  $P_4$  incomplete; four superior premolars; palatonarial border opposite anterior lobe of  $M^2$ ;

nasals pointed posteriorly. Middle Oligocene (lower Brule) ..... *A. antiquus antiquus* Leidy.  
 Size about equal to that of *Eporeodon major*; bullæ small; palate nearly flat; palatonarial border opposite posterior edge of M<sup>3</sup>; nasals pointed posteriorly; four superior premolars. Upper Oligocene (middle John Day).  
*A. guyotianus* Cope.

6. Infraorbital foramen unknown.

Size largest of this genus; four premolars; sagittal crest low and broad; brachyodont; P<sup>1</sup> two-rooted; antero-posterior diameter of molars greater than transverse. Lower Oligocene (Pipestone Creek).

*A. maximus* Douglass.

Size smallest of the genus; P<sup>3</sup> right triangular; P<sup>4</sup> equilaterally triangular in cross-section; molars broader than long; M<sup>2</sup> and M<sup>3</sup> possess internal cingula. Lower Oligocene ..... *A. minimus* Douglass.

Species large; bullæ large; nasals narrow and pointed posteriorly (Wortman); palatonarial border opposite anterior cusp of M<sup>3</sup>; three superior premolars. Upper Oligocene (Protoceras beds) ..... *A. auritus* Leidy.

Species about size of *A. latifrons*; (known from single molar tooth). Middle Miocene (lower Manchhars).

*A. sp.* Lydekker.

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