

Article IV.—NEW FOSSIL RODENTS FROM PORTO RICO, WITH
 ADDITIONAL NOTES ON *ELASMODONTOMYS OBLIQUUS*
 ANTHONY AND *HETEROPSOMYS INSULANS*
 ANTHONY.

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PLATE V.

Further discoveries resulting from a detailed study of the fossil material collected in Porto Rico in 1916 appear to be of such importance that an immediate description is much more advisable than the deferred description of the final report.¹

Two new hystricine rodents are added to the fauna of Porto Rico by the discovery of this material. One of them bears a very close resemblance to the already described *Heteropsomys insulans*,² the other is of a strikingly new type apparently connected only by subfamily relationships with its nearest relative the Porto Rican *Elasmodontomys obliquus*.²

Heptaxodon³ *bidens* gen. et sp. nov.

Plate V, Fig. 1-6.

Type, No. 17101, Dept. Vert. Pal., from a cave on the property of Don Gervacio Toraño, near Utuado, Porto Rico, July 1, 1916; collector H. E. Anthony. The type is the palatal portion of a skull from just anterior to the zygomatic roots of the maxillæ backward to a line behind the postpalatal notch; two molar teeth are present in a perfect condition and a fragment of a third.

¹ This paper is the third of the preliminary papers issued by the author on Porto Rican fossils, the others appearing as follows:

Annals New York Academy Sciences, Vol. XXVII, pp. 193-203. 9 August, 1916.

Bulletin American Museum Natural History, Vol. XXXV, Art. LXI, pp. 725-728. November 16, 1916.

² Annals New York Academy Sciences, Vol. XXVII, pp. 199-203. 9 August, 1916.

³ Heptaxodon: ἑπταῶχα, in seven parts; δδών = δδοός, tooth, in reference to the seven plates in the tooth.

The palate is short with a very deep, wide posterior notch which reaches nearly to the line of the first teeth in the molar series and is constricted sharply in front by the converging tooththrows. The zygomatic roots of the maxillæ are narrow and proportionally weak, and the antorbital foramen, incomplete in this fragment, appears to be correspondingly small. Anterior to the molar tooththrow the palate is curved abruptly away from the plane of the molar crowns.

The dentition presents the most striking feature of this genus. It appears to have but two teeth in each molar series. Certainly if there are three teeth the last one could be scarcely more than a mere rudiment, since the palate is preserved almost to the pterygoid processes, and it is apparent from the fragment that there is room for no more than the two teeth. The first tooth of the series is made up of seven transverse enamel plates alternating with connecting dentine. These laminae are practically parallel and are oblique to the long axis of the tooththrow, thus making the anterior face of the laminae turn inward toward the palate. The enamel is restricted to the anterior surface of each of the folds formed by the enamel plus the dentine. The last two plates are connected to form a crude spiral by the continuation of the sixth enamel plate internally and posteriorly until it re-enters the dentine from the outside to form the last plate. Although hypothetically formed from primary loops of enamel, the present stage of development shows no trace of a posterior closing enamel wall in any of the laminae with the exception, cited above, of the last pair of laminae. The crown surface of this tooth is about twice as long as wide. The second and last tooth of the molar series appears to be an unworn tooth, not yet above the gum, but owing to the condition of the skull fragment the tooth may well be regarded as having dropped deeper into the alveolus than the normal position. Six plates may be counted in this tooth and nothing seems to indicate that it is different from the first tooth of the series, except that it is doubtless a trifle smaller than the first. The two anterior molars have well worn crowns, and these crown surfaces are almost in the same plane. Apparently these teeth have persistent pulps and are rootless.

A mandible found in another cave is presumably of this species and helps to bear out characters expressed by the cranium. Only one tooth, the first of the molar series, is present but the specimen has the appearance of a young animal, and there is a pocket back of the first tooth evidently for the second and last molar tooth. The tooth is made up of five distinct plates which differ noticeably from those of the upper molar. The lower tooth has the enamel completely encircling the first plate, and in the other plates the enamel forms the posterior face of the plate, not the anterior, as in the upper teeth. The plates extend more nearly in the longitudinal than the transverse extent of the molar crown.

Measurements.—Width of palate just anterior to zygomatic roots, 13 mm.; length of palate from post-palatal notch to anterior alveolar border, 14 mm.; length of first tooth of molar series, 11.5 mm.; transverse width of same tooth, 5.5 mm.; length of mandible from posterior border of incisive alveolus to anterior face of condyle, 38 mm.; greatest length of molar tooth (at alveolar plane), 12.5 mm.; transverse extent of same tooth (at alveolar plane), 5 mm.

Relationships.

The generic distinctness of *Heptaxodon* is too apparent to require an extended comparison with genera either from the Antilles or the continental mainlands.

In attempting to place *Heptaxodon* in its proper family I have met anew the difficulty of associating the Porto Rican *Elasmodontomys* with any known family. Apparently *Heptaxodon* has some affiliations with *Elasmodontomys*, just how close is not easy at present to determine. Certainly the relationship does not appear to be closer than that of a subfamily. The reduction in the number of teeth, the increased complexity of the individual tooth, the shortened palate and reduced zygomatic root all point to a long separation from ancestral stock if the two forms ever did have a common ancestor. Comparisons with members of known families had practically convinced me of the distinctness of *Elasmodontomys*.¹ Now the discovery of a new genus with a fundamental similarity in tooth structure influences me to believe that a special line of development has been expressed in the Porto Rico rodents, and that this line has extended for a sufficiently long time and progressed at a sufficiently rapid rate to render the inclusion of *Elasmodontomys* and *Heptaxodon* in the same family permissible only by placing them in separate subfamilies. The differences in structure are such that were it not for the dental characters shared in common — a point that possibly may be proved later to be parallelism, but which seems most unlikely — the two genera would be placed in distinct families. A consideration of Cope's *Amblyrhiza* shows the dental structure of this large rodent to be almost identical with that of *Elasmodontomys*. Plate for plate the teeth of the two genera differ only in size. However in the few cranial characters known *Amblyrhiza* presents well marked differences from *Elasmodontomys*. Cope in his papers on *Amblyrhiza*² considered this genus to be related to the Chin-

¹ For discussion of this point by Mr. G. S. Miller see Smithsonian Miscellaneous Collections, Vol. 66, No. 12, December 7, 1916, page 3. He also considers an apparent relationship to exist between *Elasmodontomys*, *Amblyrhiza* and *Meganys* from the Santa Cruz.

² Cope.—Proc. Acad. Nat. Sci. Phila., 1868, 313; Smithsonian Contributions to Knowledge, 1883, 7.

chillas, and it is obvious when the material is examined that the resemblances are close and fundamental. Ameghino in papers on the Patagonian fauna¹ and Scott in his Princeton Patagonian Report² show that ancestral Chinchillas occurred on the South American continent at a period that bears a most significant relationship to Antillean mammalia. Consequently the facts lead me to the conclusion that these three Antillean genera, *Amblyrhiza*, *Elasmodontomys* and *Heptaxodon*, had very closely related ancestors in the Chinchillidæ. It is expecting too much of parallelism to so consistently develop identical tooth structure in three hystricine genera, the genera moreover being geographically restricted to a greater or less extent through the loss of areas incident to island formation, and consequently would be apt to show wide variation in other characters. The best treatment under the circumstances, a conservative treatment and yet one that does justice to the implied relationships, is as follows:

Family CHINCHILLIDÆ.

Subfamily Amblyrhizinæ.

Subfamily Elasmodontomyinæ.

Subfamily Heptaxodontinæ.

The order of the arrangement, beginning with *Amblyrhiza* and ending with *Heptaxodon*, gives the degree of relationship as compared with a typical living chinchillid, *Viscaccia* for example. *Amblyrhiza*, in its elongated premaxillaries and pulled-out mandibular symphysial region, is only slightly less specialized in this respect than *Viscaccia*. *Elasmodontomys* is much more generalized than *Viscaccia*, having a robust and only moderately elongated rostrum. *Heptaxodon*, although the rostrum is unknown, is probably the most specialized member of the family if considered on the basis of the dentition alone. This treatment is based necessarily on cranial characters, both because of the lack of adequate skeletal remains of *Amblyrhiza* and *Heptaxodon* and because graviportal adaptations in the case of *Amblyrhiza* confuse interpretation of characters.

Two fragments belonging evidently to the same skull indicate an animal quite closely related to *Heteropsomys*, although generically distinct. For this rodent I propose the name

¹ Ameghino.—Enum. Sist. Especies Mamif. Fós. Patagonia Austral, p. 11, Dec., 1887; Mamif. Fós. Argentina, 1889, 167.

² Scott.—Princeton Patagonian Expedition 1896-99, 1903-05, 384.

Homopsomys¹ **antillensis** gen. et sp. nov.

Plate V, Fig. 8.

Type, No. 17102, Dept. Vert. Pal., from a cave on the property of Don Gervacio Toraño, near Utuado, Porto Rico, July 1, 1916; collector H. E. Anthony. Two portions of the same skull make up most of the anterior part of the skull, minus the nasals and zygomatic arches. Teeth are lacking except for part of an incisor and a broken m².

The tooththrows are parallel and the palate is quite long, the postpalatal notch reaching barely past the posterior face of m². The palate from pre-molar to incisors is gently concave and not abruptly curved away from the plane of the tooththrows. The zygomatic roots of the maxillary are of normal proportions and the antorbital foramen is indicated as of good size. The incisive foramina are small and set in a median V-shaped excavation. Above, the skull is noticeably flattened interorbitally. The incisors are quite heavy but little can be said of the maxillary teeth. The alveolus of pm⁴ indicates either a reëntrant fold of enamel in the anterior face of the tooth or else the persistence of the roots as separate above the alveolus. The only tooth of this series present, m², is broken off just above the roots and its cross-section reveals very little beyond an indication of reëntrants from both the external and posterior faces of the tooth.

Measurements.—Palatal length (postpalatal notch to inside of incisors), 31 mm.; palatal width outside at m¹, 16 mm.; palatal width inside at m¹, 5.4 mm.; width of rostrum across premaxillary (approximate), 14 mm.; length of maxillary tooththrow (approximate), 15 mm.; interorbital width posterior to supraorbital processes, 18 mm.

Relationships.

Homopsomys requires close comparison with only the Antillean genera recently described, *Heteropsomys*,² *Brotomys*,³ and *Boromys*.³ Direct comparison of the new form with the type of *Heteropsomys*, also from Porto Rico, shows marked differences in the length of the palate (much shorter in *Heteropsomys*), in the character of the interorbital region (flatter and more restricted in *Homopsomys*), and in the size of the incisors (apparently much

¹ *Homopsomys*: ὁμός, similar; ὄχ aspect; μῦς, mouse — i. e. similar appearing mouse, in reference to its resemblance to *Heteropsomys*.

² *Annals New York Academy Sciences*, Vol. XXXVII, p. 202. 9 August, 1916.

³ *Smithsonian Miscellaneous Collections*, Vol. 66, No. 12, pp. 6, 7. December 7, 1916.

heavier in *Homopsomys*). The relationship, however, may be readily noted, and better material will doubtless show that *Homopsomys* is merely a slightly larger rodent than *Heteropsomys* and nearly congeneric with it.

Material is lacking to allow of direct comparisons with *Brotomys* (from Santo Domingo) and *Boromys* (from Cuba) but the type descriptions, aided by Mr. Miller's figures of the former genus, have served to reveal sufficient differences which prevent the reference of the Porto Rican rodent to either of these genera. *Homopsomys* has the palate intermediate in character between *Brotomys* and *Heteropsomys*, noticeably longer than in *Brotomys*. *Homopsomys* apparently has heavier incisors than *Brotomys* and lacks the horizontal anterior zygomatic roots of this genus. In addition, if the alveolar evidence of an anterior reëtrant in pm⁴ be true, *Homopsomys* has a radically different premolar from any of the other three genera. As Mr. Miller gives the characters of *Boromys* as quite similar to those of *Brotomys*, I assume that the same characters which separate *Homopsomys* from *Brotomys* separate it also from *Boromys*. Also in *Homopsomys* I find no supplemental neural groove at the base of the antorbital foramen, one of the principal characters given for *Boromys*.

The relationships of *Heteropsomys* and *Homopsomys* appear to be with the mainland Dasyproctidæ. At first sight the high rounded skull of *Heteropsomys* strongly suggests *Dasyprocta*, and this suggestion is strengthened by a detailed comparison with *Dasyprocta rubrata* from Trinidad. The molar pattern is not identical in the two forms but nevertheless the similarity in the general pattern is close enough to show that the molar of the earlier *Heteropsomys* type might very easily become identical with the molar of *Dasyprocta*. Structure for structure the relationship is expressed sufficiently to bring the two forms into the same family, at least on the basis of available material. Both *Heteropsomys* and *Dasyprocta* have rounded braincases, depressed posteriorly, a well developed supraorbital process on the frontal, incisive foramina opening toward a median excavation, proportionally weak incisors, parallel tooththrows, a very large foramen magnum, and a zygomatic arch that is fundamentally similar, although in *Heteropsomys* the jugal is much more specialized than in *Dasyprocta*. The most important points of difference between the two forms, in addition to that of the jugals, is the retreat of the incisive foramina in *Dasyprocta* so that the maxillary-premaxillary suture is free from the openings, while in *Heteropsomys* the median excavation is partly in either element; the supraorbital process is more in the superior position in *Heteropsomys*, being practically a postorbital projection in *Dasyprocta*; and the palate of *Heteropsomys* terminates with a narrow V-shaped notch as contrasted with the broad U-shape of *Dasyprocta*.

A comparison between the Paca, *Agouti paca*, and *Dasyprocta* has a significant bearing on the case. *Agouti* is found to be specialized mainly in those characters wherein *Heteropsomys* and *Dasyprocta* differ, seeming to show that these characters are the most unstable for the family. To be explicit, *Agouti* has greatly developed jugals (together with enlarged maxillary roots), the incisive foramina are near the sutural line, and the palatal notch is narrow and V-shaped. In other respects it is quite similar to *Dasyprocta* and also to *Heteropsomys*.

However, the relationships between *Heteropsomys* and *Dasyprocta* are best expressed by a subfamily division which I hereby propose, the **Heteropsomyinæ**, with *Heteropsomys insulans* as type.

Mr. G. S. Miller (*l. c.*, pages 3 and 6) compares *Heteropsomys* and his genus *Brotomys* with the Spiny Rats. I can find no such points of agreement in the Spiny Rats as I find in the Agoutis, using the type material of *Heteropsomys*, which is an almost complete skull giving many characters. While obviously differing considerably from any living Agouti, *Heteropsomys* differs even more (it appears to me) from any known Spiny Rat and the possibilities of evolving the one from the other seem remote indeed.

EXPLANATION OF PLATE V.

Figures 1-6. *Heptaxodon bidens* type.

Figs. 1-4. Natural size.

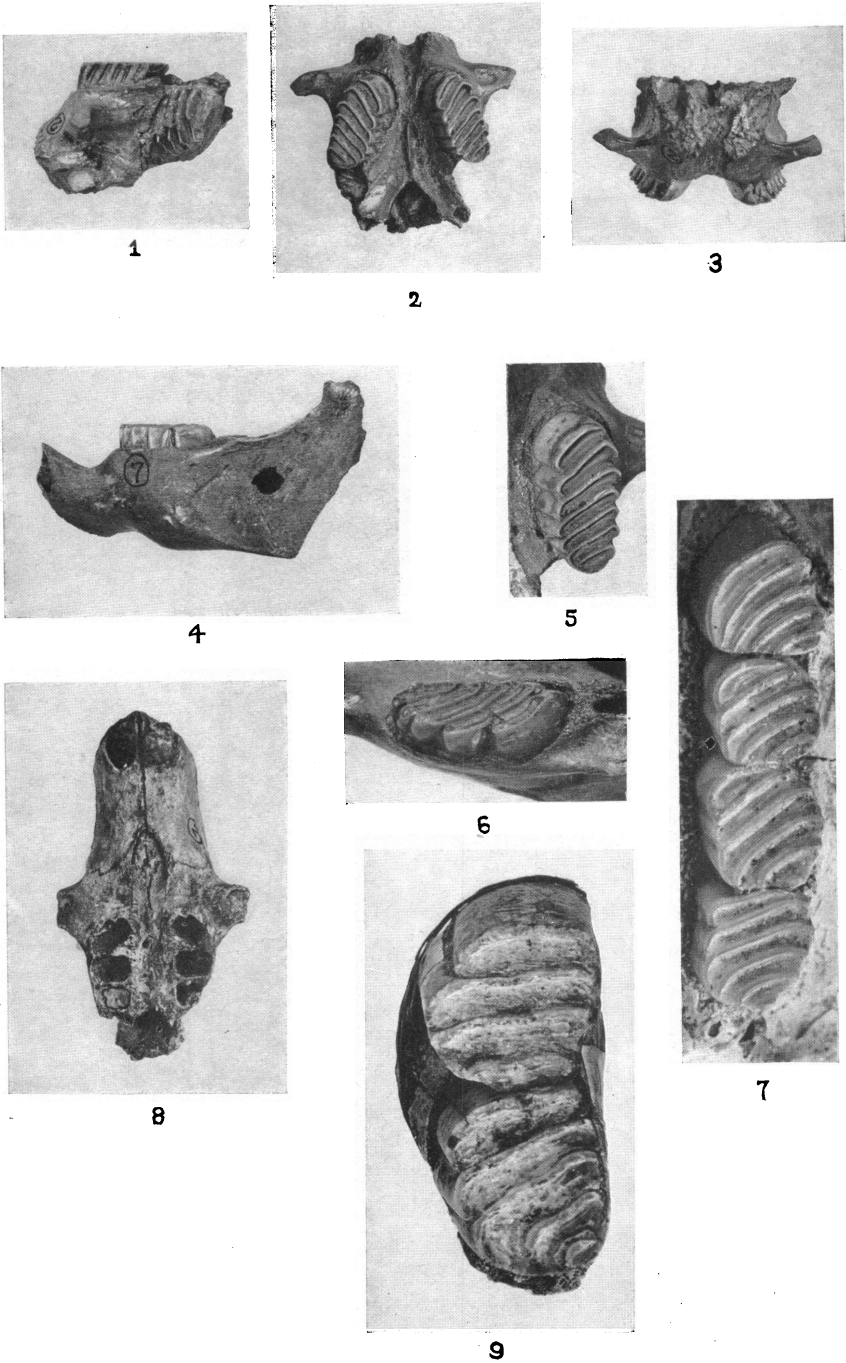
Fig. 5.— First tooth of upper molar series, twice nat. size.

Fig. 6.— First tooth of lower molar series, twice nat. size.

Figure 7.— Upper molar series of *Elasmodontomys obliquus*, twice nat. size.

Figure 8.— *Homopsomys antillensis* type, nat. size.

Figure 9.— Last two teeth of upper molar series of *Amblyrhiza inundata*, twice nat. size.



FOSSIL RODENTS FROM PORTO RICO.

Figs. 1-6, *Heptaxodon bidens*; Fig. 7, *Elasmodontomys obliquus*; Fig. 8, *Homopsomys antillensis*; Fig. 9, *Amblyrhiza inundata* (from Anguilla).

