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A NEW EOCENE MARSUPIAL FROM BRAZIL

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INTRODUCTION

Until recently mammals of probable Eocene age had been known in South America only from Argentine Patagonia.[1] There has been no knowledge as to how widespread these faunas may have been in South America or how representative the Patagonian collections may be with respect to the continent as a whole. The discovery of identifiable Eocene mammals in Brazil is therefore a paleontological event of the first importance. This discovery was announced recently by L. I. Price and C. de Paula Couto.[2] Those authors have also prepared a more detailed and illustrated account of these fossil mammals, which was presented to the Second Pan-American Congress of Mining Engineers and Geology and is now in press in the proceedings of the congress.

Among the fossils obtained from this deposit were two of such exceptionally difficult sort of preservation that they could not adequately be prepared and studied with the technical facilities and comparative materials available in Brazil. It was therefore arranged that these specimens be sent to the American Museum of Natural History in New York. One of the specimens was disappointing because on preparation it proved to be a jaw fragment of an animal so young that the teeth were unerupted and had not yet calcified sufficiently to preserve an identifiable pattern. The other specimen is the identifiable and important fossil described in the present paper.

The specimens were found by the engineers in charge of a limestone quarry near Itaborai and were given to Prof. Julio Magalhães of the Faculdade Nacional de Filosofia, in Rio de Janeiro. He transmitted them to Dr. Carlos de Paula Couto of the Museu Nacional do Rio de Janeiro, who in turn arranged for their delivery to the American Museum and for my study of them. The specimens were prepared by Mr. George O. Whitaker of our laboratory, and the drawings accompanying this paper, requiring unusual skill in accurate interpretation of the difficult material, were made by our staff artist, Mr. John C. Germann. I am deeply indebted to all these gentlemen.

This paper is first being published in English by the American Museum, and it is planned subsequently to publish a Portuguese version through the Divisão de Geologia e Mineralogia do Departmento Nacional da Produçao Mineral in Brazil. Plastotypes will be deposited in that division and in the Museu Nacional, in Rio de Janeiro.

[1] A possible exception is *Griphodon peruvianus*, known from a single specimen from Peru. Its age is unknown, but the morphology of the fossil itself suggests that it may be intermediate between Mustersan and Deseadan forms, and this might place it somewhere in the later Eocene.

[2] Price, Llewellyn Ivor, and Carlos de Paula Couto. 1946. Vertebrados fósseis do eoceno inferior de Itaboraí. Ministério da Agricultura [Brazil], Divisão de Geologia e Mineralogia, Notas Preliminares e Estudos, no. 31, pp. 1–3.

TAXONOMY

ORDER MARSUPIALIA ILLIGER, 1811

Family **Didelphidae** Gray, 1821[1]

GENUS **EOBRASILIA,**[2] NEW

TYPE: *Eobrasilia coutoi*, new species.

KNOWN DISTRIBUTION: Eocene of Brazil.

DIAGNOSIS: A marsupial of generally didelphid aspect, with some resemblance to the most primitive borhyaenids. Canine large. P^1 minute, one-rooted. P^2 intermediate, and P^3 very large and heavy. M^3 apparently ovoid in outline, without strong or angulate stylar projections. Nasal, lacrimal, frontal, and maxilla meeting, or nearly meeting, at a single point. One pair of relatively very small palatal vacuities.

Eobrasilia coutoi,[3] new species

TYPE: A.M.N.H. No. 39424, incomplete facial part of skull.

HYPODIGM: Type only.

HORIZON AND LOCALITY: Eocene, probably Casamayoran, fresh-water limestone in a cement quarry on the ex-fazenda of São José, near the city of Itaborai, Municipio de Itaborai, Estado do Rio de Janeiro, Brazil.

DIAGNOSIS: Sole known species of the genus.

DESCRIPTION

The specimen consists of much of the facial part of the skull, but badly broken and incomplete. What remains is peculiarly confusing, and its interpretation is difficult. The premaxillary region is lacking. The upper part of the left maxilla is present, but its alveolar portion is completely gone, and the palatal part is represented by its internal mold on the matrix. The facial part of the right maxilla is represented by the internal mold. The alveolar process is represented only by a fragment in the premolar region. Much of the palatal part is present, but the anterior end is missing. The posterior ends of the nasals and the anterior parts of the frontals are fairly well preserved. Much of the left lacrimal is present, but it is flaked and eroded. The anteromedial part of the right palatine is present, and the posterior nasal, or choanal, passage is represented by an internal mold. A separate piece of matrix preserves the mold of the ventral palatal surface, except the extreme anterior end, and has traces of impressions of the cheek teeth, which have made possible the counting and orientation of these.

All the cheek teeth were apparently present as the skull was buried, but most of these were lost when the rock was cracked open, revealing the specimen. Five teeth were preserved, and it has been possible to place these as right P^{1-3} and left P^3 and M^3. All are worn, and M^3 is badly crushed and broken. The teeth do not make contact on the skull fragment, but with the help of the external palatal mold their exact positions could be determined, and they have been mounted on wires in the correct places on a cast of the palate.

The animal was about as large as a robust *Didelphis virginiana*, and the general aspect of the preserved part of the face is similar. There is a relatively broad, subquadrate frontal table, slightly depressed at the midline. The snout narrows moderately anterior to the orbits, and the dorsal nasal contour is nearly a straight line, sloping downward anteriorly.

The nasals are long, their median posterior point at a level about midway between the anterior orbital rim and the postorbital process. In *Didelphis* they are usually still longer and in *Dasyurus* slightly shorter, but both families include forms with the nasals of about the same relative length as in the fossil. Known borhyaenids include almost the whole didelphid-dasyurid range in this respect. The nasals come to a somewhat rounded median point posteriorly, and

[1] Or possibly Borhyaenidae Ameghino, 1894; see discussion of affinities.

[2] The generic name is meant to suggest an Eocene fossil from Brazil. It does not have reference to the genus *Brasilia*, a mollusk, with which confusion is hardly possible.

[3] Named in honor of Carlos de Paula Couto.

anterior to this, near the level of the anterior orbital rim, they are considerably expanded laterally. The sutures here are complex and somewhat eroded on the fossil, but it appears that nasal, lacrimal, maxilla, and frontal all meet, or nearly so, in a common point. This is a distinctly didelphid character. In dasyurids the frontal and maxilla meet broadly, separating the nasal and lacrimal. In borhyaenids the nasal usually meets broadly with the lacrimal and separates maxilla and frontal. In *Arminiheringia*, however, naso-lacrimal contact is short. This part of the face is not known in other very early or in the most primitive borhyaenids. They probably were near the didelphid condition in this region, and it is distinctly possible that primitive borhyaenids here resembled *Eobrasilia*. Among later borhyaenids, *Borhyaena* typically has a well-established naso-lacrimal contact, but in Princeton No. 15120 this is probably no longer than in *Eobrasilia*.

The median nasal suture is still visible and partly open, but had begun to fuse.

The frontals are fully fused at the midline, as is usual in adult marsupial carnivores. The extent of development of the diverging anterior branches of the sagittal crest cannot be determined. There is a short, blunt postorbital process as in *Didelphis* and most comparable forms.

The lacrimal, poorly preserved, seems to have had about equal facial and intraorbital parts, although the latter may have been somewhat larger, as is usual in comparable later marsupials. The foramen cannot be made out with certainty, but it was apparently on the orbital rim, much as in *Didelphis*. In dasyurids it is usually facial and in borhyaenids usually intraorbital, although *Arminiheringia*, again, resembles *Didelphis* in this respect.

As far as preserved, the maxilla is not distinctive, except for the posterolateral relationships, already discussed. The internal mold is comparable point for point with an internal mold of *Didelphis*, aside from slight changes of proportion or sharpness of various features. Dasyurids seem, however, to be equally similar, and no defined borhyaenid internal mold of this region is available.

The palatines are broadly expanded on the palate and reach forward at the midline to approximately the level of the anterior side of M^2. The width of the palatines between M^4 was approximately 13 mm. At the anterolateral corners of the palatines, between them and the maxillae, are small vacuities, that on the right side about 3 mm. in length and that on the left about 7 mm. Although there is great variation in the vacuities in these families, it is normal and, apparently, primitive for didelphids and dasyurids to have relatively much larger vacuities in this position. The fossil lacks the second, smaller, more posteromedian pair of vacuities within the palatines usual in didelphids. As far as known, definitely referable borhyaenids have no vacuities, although it cannot be doubed that they were derived from forms with vacuities and that vacuities may have occurred in their most primitive representatives. The present fossil definitely, although not conclusively, suggests a trend from didelphids to borhyaenids in this respect. Little can be made out of the posterior and posterolateral rims of the palate, but the posterior rim was apparently thickened and raised and the posterior palatine foramina were evidently present and in the usual position—indifferent didelphid or borhyaenid characters. On the palatal mold may be seen what appears to be the palatine-pterygoid suture, which is more vertical and more anterior than usual in comparable forms, but this is not certain or clearly significant.

No evidence as to the incisors is available.

On the left side the upper part of a canine alveolus is visible, with the end of the canine root still present. At this point, where the root would be at or slightly below its greatest size, the maximum diameter is about 6 mm. and the minimum diameter 3.5 mm. This indicates a moderately compressed, laniary canine relatively nearly as large as in *Didelphis* or some of the more primitive borhyaenids. Judging from the facial swelling over it, the alveolus extends

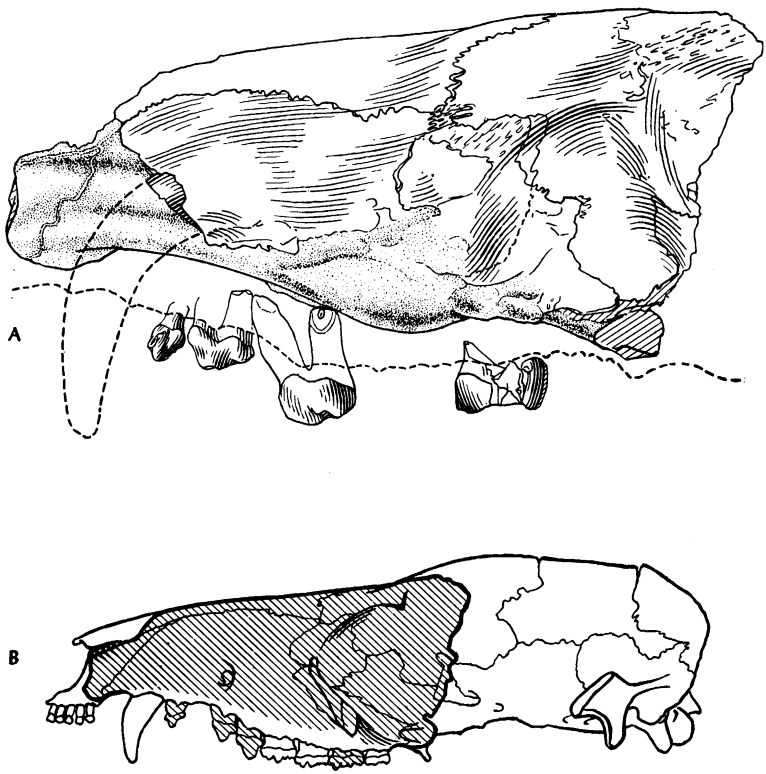

Fig. 1. A. *Eobrasilia coutoi*, new genus and species. Type, A.M.N.H. No. 39424, incomplete facial part of skull. Left lateral view. P^{1-2} are reversed from the opposite side. The teeth are shown in their approximate natural positions, although they do not make contact with the rest of the specimen, and the alveolar border is not preserved. Parts shaded with lines have bone surface preserved. Parts shaded with dots are matrix, preserving a natural internal mold of the missing bones. 3/2 natural size. B. Sketch of skull of *Didelphis* with cross hatching, indicating parts homologous to those preserved in the type of *Eobrasilia coutoi*. The zygoma is shown as cut away. 3/4 natural size.

far up the face, almost to the maxillo-nasal suture.

P^1 is a tiny tooth with the base of the crown 3.7 mm. in its longest and 2.2 mm. in its shortest diameter. It is implanted by a single, slender root and is turned so that the longest dimension, normally anteroposterior, is anteroexternal-posterointernal. It has a somewhat procumbent main cusp, preceded by a small accessory cuspule and followed by a slightly larger but lower heel. The outer face is smoothly convex, the inner somewhat excavated.

P^2 is a considerably larger tooth, 5.8 mm. long and 3.6 mm. wide, implanted by two roots, and normally oriented. The outline is ovoid, and the posterior part, especially, is unusually heavy. It is deeply truncated by wear, the plane of which dips sharply upward posterointernally. The main cusp is preceded by a very small accessory cuspule and was apparently followed by a well-differentiated heel.

P^3 is strikingly large and heavy, the crown about 8.5 mm. long by 5.2 mm. wide. (Measured on right P^3; left P^3, as preserved, is shorter, but this is probably influenced by wear.) This tooth also has two roots and normal orientation. It is even more deeply worn than P^2, and the coronal detail is obliterated. In addition to a main wear facet like that on P^2, the

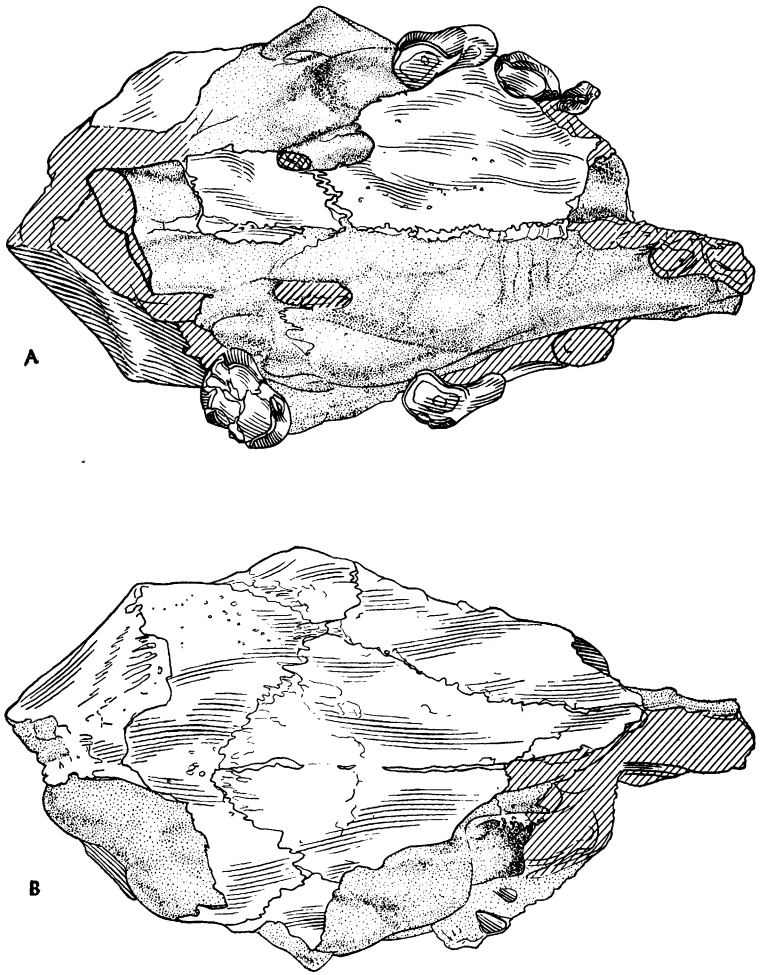

Fig. 2. *Eobrasilia coutoi*, new genus and species. Type, A.M.N.H. No. 39424, incomplete facial part of skull. Teeth, not actually in contact with preserved part of skull, are shown in their approximate natural positions. Parts shaded with lines are preserved bone surface. Parts shaded with dots are matrix, preserving a natural internal mold of missing bones. Parts cross hatched are broken matrix surface. A. Palatal view. B. Dorsal view. The anterior end is to the right. 3/2 natural size.

anterointernal part is worn and broadly grooved. On left P^3, but not right, there is also a small worn notch in the sharp enamel edge external to the main worn facet. Just anterosuperior to this notch is a tiny tubercle, not seen on right P^3.

M^1 and M^2 are not preserved. Obscure traces on the natural palatal mold suggest that M^1 was smaller than P^3 and M^2 slightly larger than M^1.

Left M^3 is preserved, but it has been badly crushed and fragmented. It may originally have been about 8.5 mm. in length and about 9 mm. in breadth. The anteroexternal and internal margins are smoothly rounded, distinctly less angulate than in known borhyaenids or in didelphids except, perhaps, a few Cretaceous forms. The metastylar region is so broken that it is uncertain whether there was a metastylar

spur, but there is no evidence for this, and the whole crown may have been rather smoothly ovoid in outline. The surface is deeply truncated by a nearly horizontal wear facet, and this has obliterated all coronal detail except a small anterior cuspule, near but somewhat lingual to the antero-external point of the crown. Its position is more or less nominally parastylar, but it does not project as does the first style, or parastyle, of usual didelphids, borhyaenids, or dasyurids.

M^4 is not preserved. A partial impression on the palatal mold shows that the internal projection was rounded, like that of M^3 but apparently somewhat smaller.

AFFINITIES

Eobrasilia is clearly a polyprotodont marsupial and must belong to the Didelphidae, Borhyaenidae, Dasyuridae, or a new family. Reference to the Dasyuridae is unjustified and does not come further into question if separation of Borhyaenidae and Dasyuridae be granted; *Eobrasilia* has no distinctly dasyurid characters in the known parts and does have at least one diagnostically non-dasyurid character: the nature of the naso-lacrimal approach.

The general habitus is that of a robust didelphid or of a very primitive borhyaenid. Aside from the cheek teeth, which are neither didelphid nor borhyaenid in aspect, as discussed below, the known parts are so closely similar in didelphids and in primitive borhyaenids that decision is difficult. There are only two points that might be diagnostic between these families among the known characters of this fossil. The nasal-frontal-lacrimal-maxillar contact is distinctly didelphid as opposed to typical borhyaenids. But the condition is not very different in *Arminiheringia*, an early (Casamayoran) but not particularly primitive borhyaenid or in the later (Santacrucian) *Borhyaena*, and this region is not known in truly primitive early borhyaenids, which might even be expected to resemble *Eobrasilia* in this respect. The presence of palatal vacuities is, again, diagnostic of the Didelphidae as opposed to characteristic and more or less specialized Borhyaenidae, but again this is not conclusive. The vacuities are greatly reduced from the usual didelphid condition (known to have been fully established in the Cretaceous). The small, single pair of vacuities in *Eobrasilia* is, indeed, as near the specialized borhyaenid condition (no vacuities) as the typical didelphid condition (large vacuities, and often two pairs). Again, this region is not known in truly primitive early borhyaenids, which might be expected to resemble *Eobrasilia* here.

The possibilities of basic borhyaenid affinities must be viewed in the light of the fact that in the Riochican and Casamayoran of Argentina there are several small marsupials that seem, from their teeth, to be intermediate between didelphids and borhyaenids. Pertinence of *Eobrasilia* to such a stock, or derivation from it, is a distinct possibility. These Argentine forms are known from teeth only, which are not much like what is known of the peculiar *Eobrasilia* dentition.[1]

Although the aspect of *Eobrasilia* is much like *Didelphis*, it is not like the previously known early or middle Tertiary didelphids of South America, and as between these only and the borhyaenids it is more borhyaenid. These particular didelphids are all microbiotheres, tiny, insectivore-like forms.

What is known of the dentition of *Eobrasilia* is highly peculiar and suggests no particular group of marsupials, although derivation from either didelphids or basic borhyaenids would be possible with moderate subsequent specialization. Lack of knowledge of the coronal molar pattern of *Eobrasilia* is strongly felt, but the enlarged and heavy P^3 and the rounded M^3 without parastyle or protocone angulation are peculiar features, quite off the lines of later didelphid or borhyaenid trends. *Borhyaena* does, indeed, have P^1 reduced and rotated and P^3 enlarged and heavy, much as in *Eobrasilia*. This may well represent

[1] This excludes possible synonymy of *Eobrasilia*. Only one of the Argentine forms in question has been named: *Patene* Simpson, 1935.

a parallel borhyaenid trend, but M^3 in *Eobrasilia* seems to have been quite unlike that of *Borhyaena*. There is some suggestion of habitus resemblance to the North American Cretaceous Thlaeodontinae, which also have heavy P^3 and somewhat rounded molars, but this is not likely to indicate special affinity. The thlaeodontine premolars are more highly and differently specialized than in *Eobrasilia*, and the molar parastyle, the only available detail for molar comparison, is quite different. *Caroloameghinia*, from the Casamayoran of Argentina, is a marsupial with rounded molars, but special affinity with *Eobrasilia* is unlikely. *Caroloameghinia* included very small animals of quite different aspect and with the lower canine, probably also the upper, reduced. Upper premolars are unknown, but the lower premolars would not occlude with upper teeth trending towards *Eobrasilia* in specialization. For instance, P_3 is, if anything, somewhat reduced relative to P_1 and P_2.

The somewhat peculiar adaptive type of the known parts of the *Eobrasilia* dentition suggests that it belongs on an aberrant line not otherwise known. More complete knowledge is necessary before deciding how distinctive that line is, whether, for instance, it should be recognized as a separate subfamily.

As a matter of morphological diagnosis the known parts of *Eobrasilia* can enter the Didelphidae, and the genus does not appear to be close to any known borhyaenid. It is therefore now formally, but tentatively, placed in the Didelphidae. I suspect, nevertheless, that it represents a line derived from the earliest borhyaenids or from a didelphid-borhyaenid transition group.

AGE AND OCCURRENCE

Mammals found associated with *Eobrasilia* include *Henricosbornia* and *Trigonostylops*. These genera, previously known only from Patagonia, are there characteristic of the Casamayoran, although *Henricosbornia* also occurs in the late Riochican, and *Trigonostylops* somewhat doubtfully in the Mustersan. The deposit must be approximately Casamayoran in age. *Eobrasilia* is unknown elsewhere and casts no further light on this correlation. Further details as to the occurrence and the associated fossils are given in the paper by Price and de Paula Couto cited previously and, especially, in their more complete report now in press.