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## A New Genus and Species of Abrocomid Rodent from Peru (Rodentia: Abrocomidae)

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### ABSTRACT

A new specimen of a giant, arboreally adapted abrocomid rodent from the northern Vilcabamba Mountains of Cusco, Peru, is here described as a member of a new genus and species. The arboreal nature of the external morphology of the holotype differs strikingly from that of all other known Abrocomidae, which are terrestrial. A species known only from remains found in Inca tombs, *Abrocoma oblativa* Eaton, 1916, is placed in the new genus.

### RESUMEN

Un nuevo ejemplar de una rata gigante arborícola de la familia Abrocomidae, de la Cordillera de Vilcabamba, Cusco, Perú, es descrito como una especie nueva dentro de un género nuevo. La morfología externa arborícola del holotipo es notablemente diferente a aquella de todos otros Abrocomidae conocidos. Una especie conocida sólo de restos encontrados en tumbas Incas, *Abrocoma oblativa* Eaton, 1916, también es considerada como miembro del nuevo género.

### INTRODUCTION

Following his discovery of the Inca ruins at Machu Picchu, Hiram Bingham sponsored the Yale-National Geographic expeditions,

led by George Eaton in 1912 to excavate Inca graves around the site (Eaton, 1916), and by Edmund Heller in 1915 to collect birds and mammals of the region (Heller collections, reported by Thomas, 1920). Eaton

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(1916) discovered the bones of a number of mammalian species that had been placed in graves with human burials, including two taxa he named as new species, a paca (*Agouti thomasi*) and an abrocomid rodent, *Abrocoma oblativa*. Heller's extensive inventories of the mammals of the surrounding regions failed to uncover living examples of *A. oblativa* and Thomas (1920) concluded that it was likely extinct. It has never been reported since.

The South American hystricognath family Abrocomidae is known from three living species, *Abrocoma bennetti* Waterhouse, 1937, *A. cinerea* Thomas, 1919, and *A. boliviensis* Glanz and Anderson, 1990. Eaton placed his Inca tomb specimens in the genus *Abrocoma* because of a strong cranial resemblance. It was retained in *Abrocoma* by Glanz and Anderson (1990) in their recent review of the genus.

In 1997, on an expedition to the northern Vilcabamba range of Perú, I encountered a freshly killed giant abrocomid rodent on a cloud forest trail. This animal is highly divergent in external morphology from the other living Abrocomidae (Glanz and Anderson, 1990), and I describe it below as a member of a new genus, to which Eaton's *A. oblativa* is clearly also a member. It has major cranial differences from Eaton's rat, which warrant distinguishing it as a new species.

### *Cuscomys*, new genus

TYPE SPECIES: *Cuscomys ashaninka*, new species.

INCLUDED SPECIES: *Abrocoma oblativa* Eaton, 1916.

ETYMOLOGY: Mice from Cusco, Peru, the Department of origin of all known specimens, and the city of the Incas, from whose graves the first specimens of *A. oblativa* were identified. The generic name is masculine.

DIAGNOSIS: The largest known living abrocomid rodent, and the only genus with morphology suited to arboreal life. Tail greater than 75% of head and body length; feet broad, with strong curved claws, hallux stout and long, reaching beyond base of adjacent toe. Condylbasal length > 60 mm; rostrum long and robust, nearly as broad as interorbital region; nasals inflated distally; frontals

not widening behind postorbital process; palate between upper toothrows only slightly concave; prominent ridge along medial suture of palatine bones; temporal foramen present posterior to postglenoid vacuity; sigmoid notch of mandible long, and coronoid process low on ramus; medial condyloid ridge does not approach or meet posterior edge of mandible; dorsal projection of mastoid bones between occipital and parietal small and not inflated (bulging dorsally).

REMARKS: Because one of the two species, *Cuscomys oblativus*, is known only from osteological material, little external morphology is included in the diagnosis of the genus. The distinctive external morphology of the genotype is detailed below under its species diagnosis and description: many of its features may also be diagnostic of the genus.

### *Cuscomys ashaninka*, new species

HOLOTYPE: Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima Perú (MUSM) 12715. A young female collected 15 June 1997 by Louise H. Emons (field no. LHE 1359). Skin in good condition except for sewn-up hole in nape, with right fore and hind feet; body with left feet preserved in fluid; cranium and mandible in good condition, with small holes in supraoccipital and some other slight predator damage to occipital region and tips of angular processes. Tissue samples preserved in ethanol are deposited in the National Museum of Natural History.

TYPE LOCALITY: Peru: Departamento de Cusco, northern Cordillera de Vilcabamba; 11°39'36" S; 73°40'02" W (by GPS, map datum WPS-84); elevation 3370 m (fig. 1).

HABITAT AND REMARKS: The holotype was found freshly dead, with a severe bite wound on the back of the neck. It was probably killed by a long-tailed weasel (*Mustela frenata*), of which a specimen was collected nearby. Punctures in the cranium fit the canine teeth of this predator and the neck bite is consistent with a weasel kill. The specimen was found on a steep slope in tall wet, mossy, cloud forest dominated by *Weinmannia fagaroides/microphylla* and *Polylepis* cf. *pauta* trees, and with abundant *Chusquea* sp. scandent bamboo. Detailed descriptions of

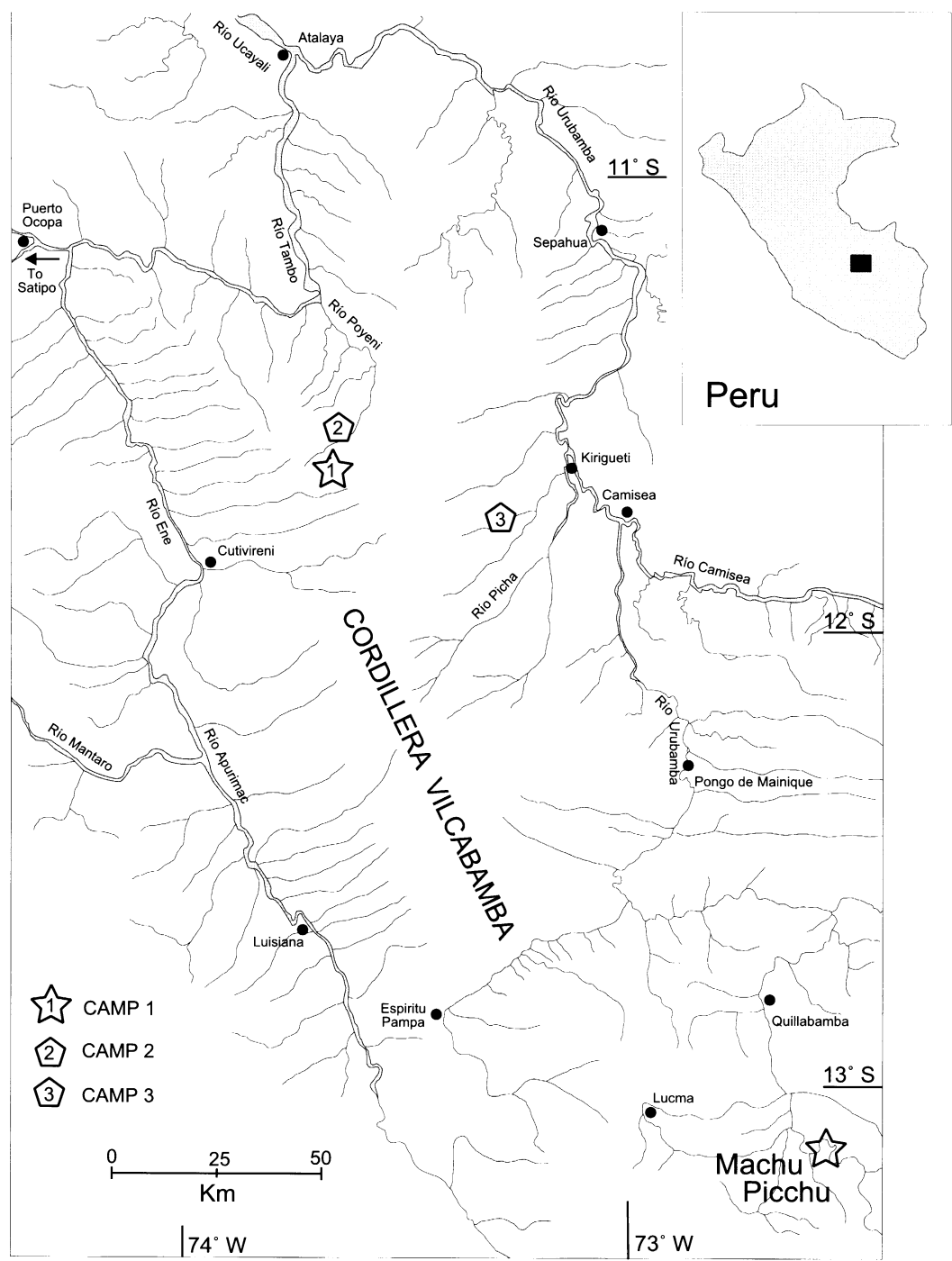


Fig. 1. The approximate collecting localities of the 1997 (Camps 1 and 2) and 1998 (Camp 3) RAP Expeditions to the Cordillera de Vilcabamba; showing the type localities (stars) of *C. ashaninka* at Camp 1, and of *C. oblativus* at Machu Picchu (modified from Schulenberg, 1999).



Fig. 2. The holotype of *C. ashaninka*, MUSM 12715. The soft tissues of the back of the head and neck were severely damaged by a predator, and the crown and white blaze would likely be higher in intact individuals. [Top photo by M. Romo, lower photos L. H. Emmons]

the vegetation and fauna can be found in Schulenberg (1999). The specimen was collected on an expedition to inventory the flora and fauna of the northern Vilcabamba range for Conservation International's Rapid Assessment Program.

**ETYMOLOGY:** Named in honor of the Ashaninka people who live on the lower slopes of the Cordillera de Vilcabamba below the

type locality. The specific name should be considered a noun in apposition.

**DIAGNOSIS:** Head and body length over 300 mm; tail over 200 mm; hind foot length over 60 mm. Greatest length of skull > 65 mm; skull flat in dorsal profile; foramen magnum much wider than high; premaxillary bones of rostrum not widening posteriorly; auditory bullae considerably inflated; lach-



Fig. 3. Feet of the fresh specimen of the holotype of *C. ashaninka*, MUSM 12715. On forefoot (left), note the lack of a pollux, the sparse unguis tufts, and the long vibrissa on forearm; on hindfoot (right), note the well-developed hallux (on right), absence of well-defined pads, cupped claw on the first digit, and well-developed unguis tuft only on middle digit. [Photos by L. H. Emmons]

rymal canal under maxillary root of zygoma open, with incomplete covering of bone; posterior loph of M3 pointing labially and with a nearly straight posterior border.

**DESCRIPTION:** A large pale-gray rat with long, dense pelage; abundant, black guard hairs 40 mm long extending 20 to 25 mm above underfur on mid-dorsum, imparting blackish coloration along mid-back; sides paler, sprinkled with mixture of white and dusky overhairs. Underfur pale gray, soft and somewhat wavy; venter gray, with hairs lightly frosted, not contrasting with sides; chest the same color as sides, but slightly darker than abdomen (fig. 2). Midline of chest between forelegs with a 30 mm long streak of short hair, probably associated with a sternal gland. Head with a narrow white blaze from nose to crown. Lips and chin white. Incisors exposed in freshly dead specimen (fig. 2). Mystacial vibrissae dense, stiff, and either white or dusky (fig. 2), reaching behind shoulder when flattened against body; three superciliary vibrissae, the two posteriormost 65 mm; no genal vibrissae evident;

one vibrissa on mid-forearm (fig. 3). Ear pinnae nearly naked, but fur at base of ears long, nearly reaching the ear tips (fig. 2). Feet thinly clothed with dusky hairs, hallux without unguis tuft, the other four digits of hindfoot with long dusky unguis tufts reaching beyond tips of stout, strongly curved claws (fig. 3). Forefoot with no evidence of pollux; unguis tufts on four digits short and sparse, not reaching tips of slender, sharp claws. Feet broad, soles pigmented proximally but not distally (white in the fresh specimen); covered with tiny tubercles; palmar and plantar pads soft and poorly defined (fig. 3). Tail robust, clothed with stiff hairs that incompletely hide scales; sharply bicolored dark, slightly reddish brown for basal 150 mm, white for distal 140 mm, (fig. 2). One pair of inguinal mammae at base of mid-thigh, search of pectoral, abdominal, and pelvic fields uncovered no other mammae, but the specimen was primiparous and the mammae are small. External measurements (mm) of the holotype are as follows: head and body, 346; tail, 263; hindfoot, 59/65; ear, 37; mass, 910 g.

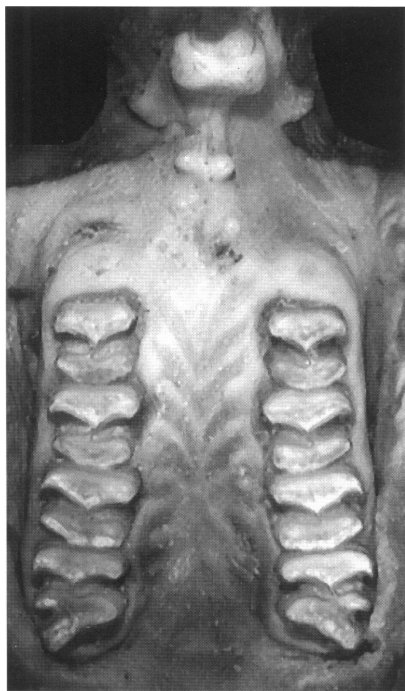


Fig. 4. Palate of the holotype of *C. ashaninka*, MUSM 12715.

Palate with seven ridges that converge medially and posteriorly to form a star shape at the level of the first loph of M2 (fig. 4). Soft tissue under diastema with a large, fleshy, bulbous, medial papilla and two widely spaced pairs of smaller papillae decreasing in size posterior to it (fig. 4). The holotype has one tiny embryo in the right uterine horn ( $8 \times 5$  mm including uterine tissue). The digestive tract was measured after fixation by cutting the mesenteries and measuring without stretching: small intestine, from stomach to caecum, 240 cm; caecum 25 cm; colon from junction of caecum and small intestine to anus, 143 cm. The stomach was enormously engorged; the removed contents measured a minimum of 140 cc settled volume in 70% ethanol (a small amount was lost), and consisted of extremely finely triturated green plant material, including fruit with lignin granules, and unidentified plant tissue. The colon was filled with formed fecal pellets for most of its length, a number of them side by side or overlapping within the same diameter of colon. Fecal pellets in

the colon measured 17–18 mm  $\times$  7.0–7.5 mm.

**CRANIUM:** Skull robust, with flat dorsal profile and broad, deep rostrum. Auditory bullae considerably inflated, but not extremely so for the family; bullae well separated ventrally by a wide basisphenoid; auditory tubes long and salient (fig. 5). Nasal bones broad and slightly inflated distally, the two posterior tips meet in a straight line with no intercalation of the frontals; the premaxillary bones of the rostrum do not widen posteriorly. Frontals widest anteriorly, constricting posterior to postorbital processes; dorsal projections of the mastoid bones small and uninflated; supraoccipital crest strongly developed. One prominent temporal foramen is present posterior to the postglenoid fissure. Incisors large and robust; upper incisors proodont; diastema with flat ventral profile parallel to line of occlusal surface of cheek-teeth. Maxillary tooththrows slightly divergent posteriorly. Mandible robust for the family, with angular and condyloid processes dorsoventrally deep; medial condyloid ridge passing midway up center of process, not approaching its posterior edge; external tip of condyloid process with a well-defined, short medial crest; coronoid process low on mandible; sigmoid notch long. Viewed from above inferior masseteric ridge with a smoothly curved profile (fig. 6). Occlusal pattern of cheekteeth generally as in other members of the family, with the following distinctions: maxillary cheekteeth with lingual flexi at a shallow angle and nearly equal in length with labial flexi, such that the mid-tooth mure is short and nearly parallel to the tooth axis, and the major anterior and posterior lophs are almost parallel. Posterior loph of M3 with an almost straight posterior margin and pointing laterally; medial labial loph on M3 small and tapering distally; posterior borders of lingual posterior lophs of M1 and M2 with little curvature (fig. 7).

#### Comparisons With *C. oblativus*

That the two known crania of *C. oblativus* (figs. 8, 9) are so alike in all features gives confidence to the likelihood that the markedly distinct recent specimen represents a separate species. Judging from the degree of

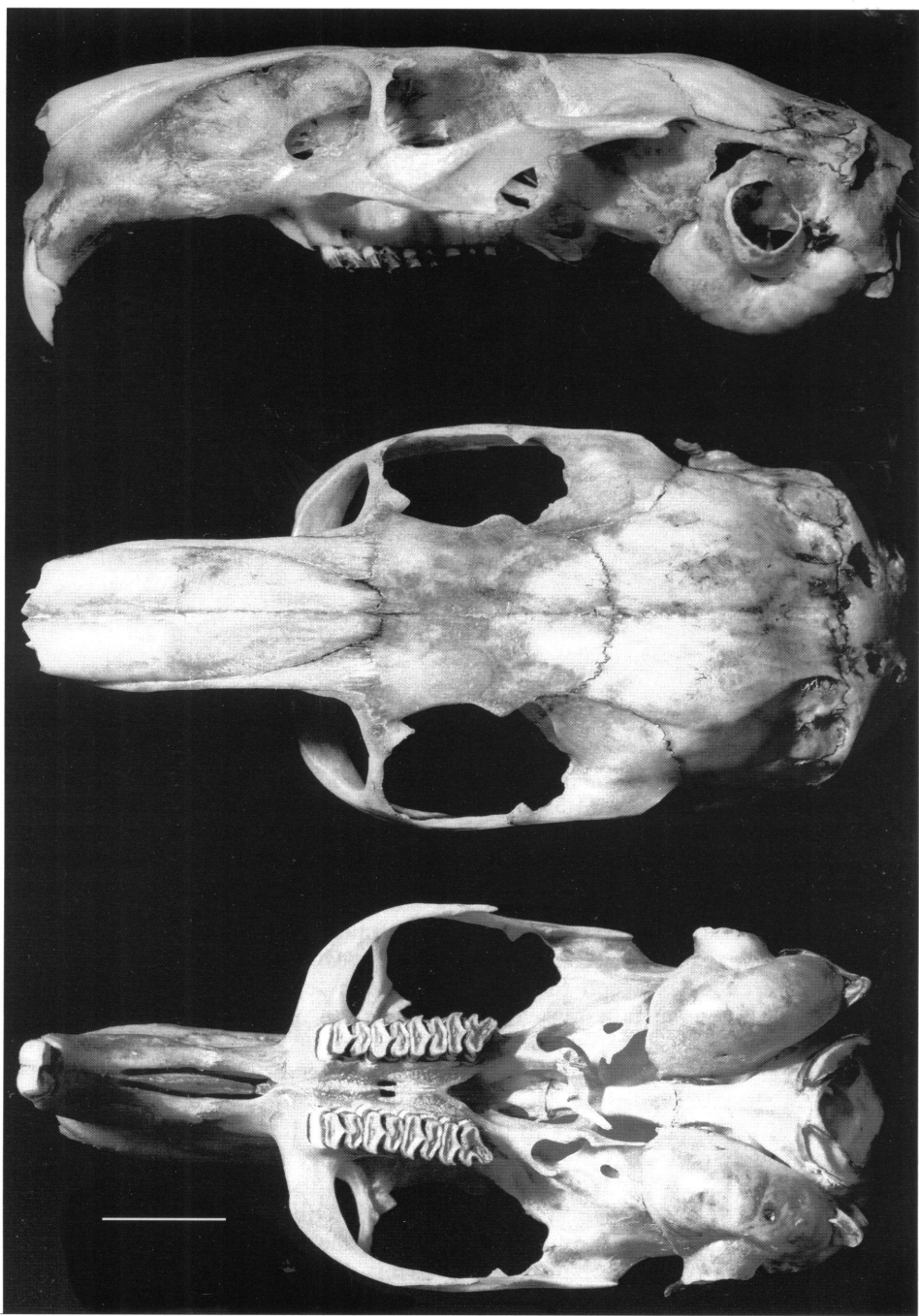


Fig. 5. Skull of the holotype of *C. ashaninka*, MUSM 12715. Scale bar = 1 cm.

fusion of the basisphenoid-basioccipital suture, the holotype of *C. oblativus*, YPM 3320, is an older individual than the holotype of *C. ashaninka*, but the other specimen,

YPM 3318, is about the same age and should be in comparable age-related development. Although the sexes of the *C. oblativus* are unknown, other Abrocomidae do not exhibit



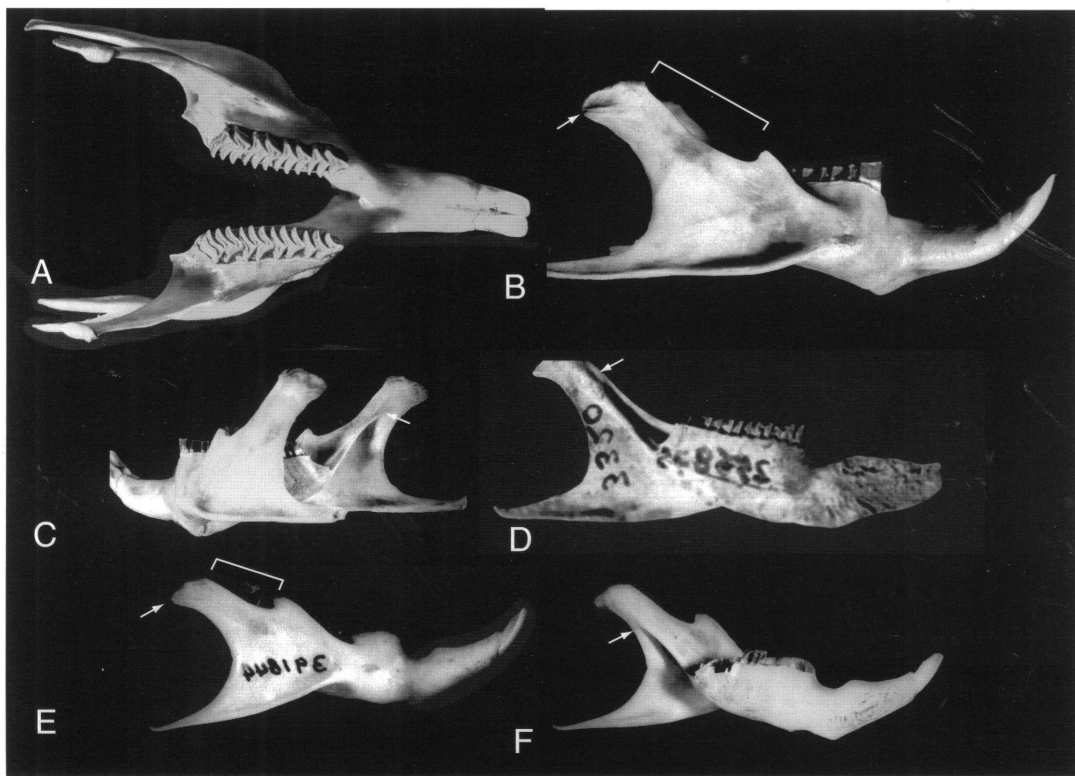


Fig. 6. Mandibles: A–C, *C. ashaninka* holotype, MUSM 12715; D, *C. oblativus*, holotype, YPM 3320; E, F, *Abrocoma bennetti*, USNM 391844. Note differences in position of the medial condyloid ridge in C, D, F (arrows); crest on exterior condyloid process (arrow in B); and great length of sigmoid notch and low position of coronoid process in B relative to E (brackets). Figs. D, E reversed.

sexual dimorphism in size or cranial morphology (William Glanz, in litt.), so it is unlikely that the differences between the two *C. oblativus* and the recent specimen are due to sexual dimorphism. The *C. ashaninka* skull is longer (GLS, BAL, CBL) and broader (ZB and MB). Its tympanic bullae are much longer; but it is slightly smaller in incisor width, toothrow length, and interorbital constriction. Their skulls differ strikingly in lateral profile (figs. 5, 8, 9). *Cuscomys oblativus* has a strongly arched dorsal profile and opisthodont incisors; the tympanic bullae are much less inflated than in *C. ashaninka*, and the bony auditory tubes are shorter, with the openings more laterally, versus more upwardly directed in *C. ashaninka*. The maxillary process of the superior zygomatic root of *C. oblativus* is broader anter-posteriorly, and canted such that the superior root is anterior to the inferior root; but the narrower

zygomatic process of *C. ashaninka* slants in the opposite direction. The nasals of *C. oblativus* are separated posteriorly by an anterior projection of the frontal bones, and the premaxillae of the rostrum widen posteriorly when viewed dorsally (figs. 8, 9). The foramen magnum of *C. ashaninka* is wider than high, while in *C. oblativus* it is subcircular and slightly higher than wide (fig. 10). The maxillary toothrows of *C. oblativus* have less posterior divergence than those of *C. ashaninka*; the posterior loph of M3 of *C. oblativa* is directed posteriorly, and has a strongly concave posterior border, while the medial labial loph of the same tooth is broad and square, rather than tapered (fig. 7).

#### Comparisons with *Abrocoma* spp.

The genus *Abrocoma* was reviewed by Glanz and Anderson (1990), who defined the



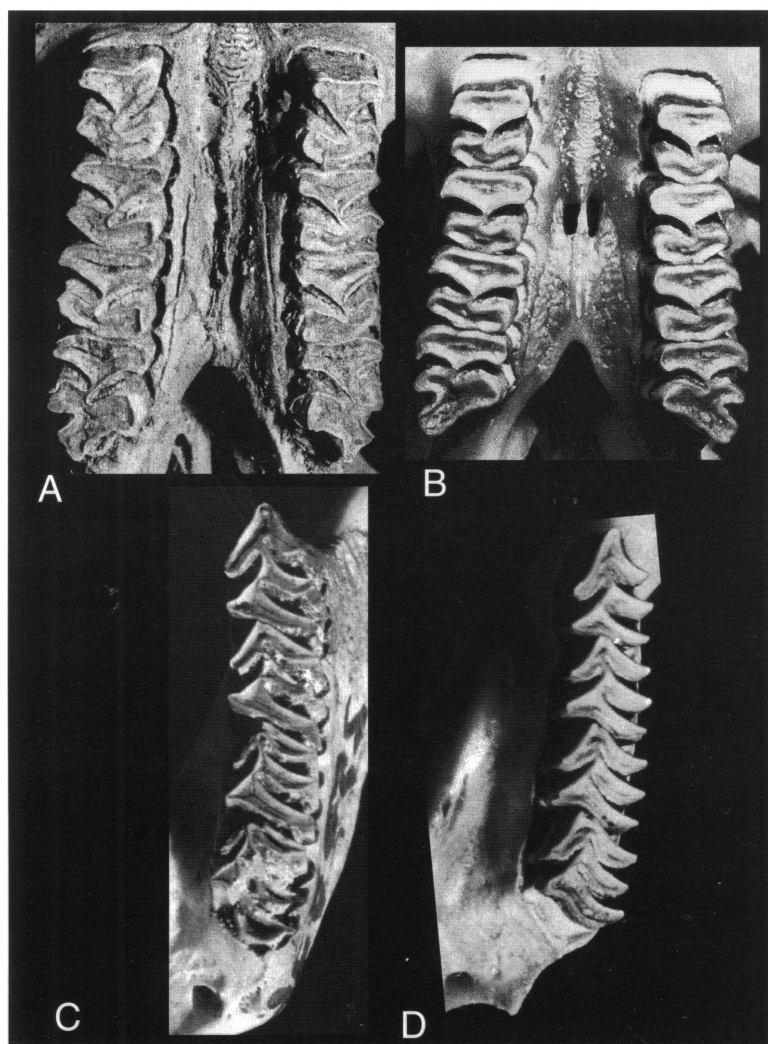


Fig. 7. Upper and lower tooththrows: A, C, *C. oblativus* holotype, YPM 3320; B, D, *C. ashaninka* holotype, MUSM 12715.

family in relation to members of the Octodontidae and Chinchillidae, described a new species, and presented cranial measurements and illustrations of all taxa. I have not seen *A. boliviensis* and, therefore, I rely on their description for comparisons. They commented on *A. oblativa*, from Eaton's (1916) original measurements and excellent figures, and noted some of the same distinguishing characters that I mention below.

The three species of *Abrocoma* are medium-size rodents with rotund bodies, soft, silky pelage, small narrow feet with short claws and a reduced hallux, and medium-

length to short, hairy tails. The two species for which there is information (*A. bennetti*, *A. cinerea*) occupy high elevations or high latitudes, live in open habitats among rocks, and use burrows (Pearson, 1951; Fulk, 1976; Nowak, 1991). Their bauplan is reminiscent of that of pikas, degus, chinchillas, and other montane, steppe- or rock-dwelling rodents. *Cuscomys ashaninka* is strikingly different morphologically: its large size, broad, strongly clawed feet, long, bristly looking pelage, white markings, and long, hairy, bicolored tail resemble giant murid cloud-rats and arboreal rats such as *Ma-*

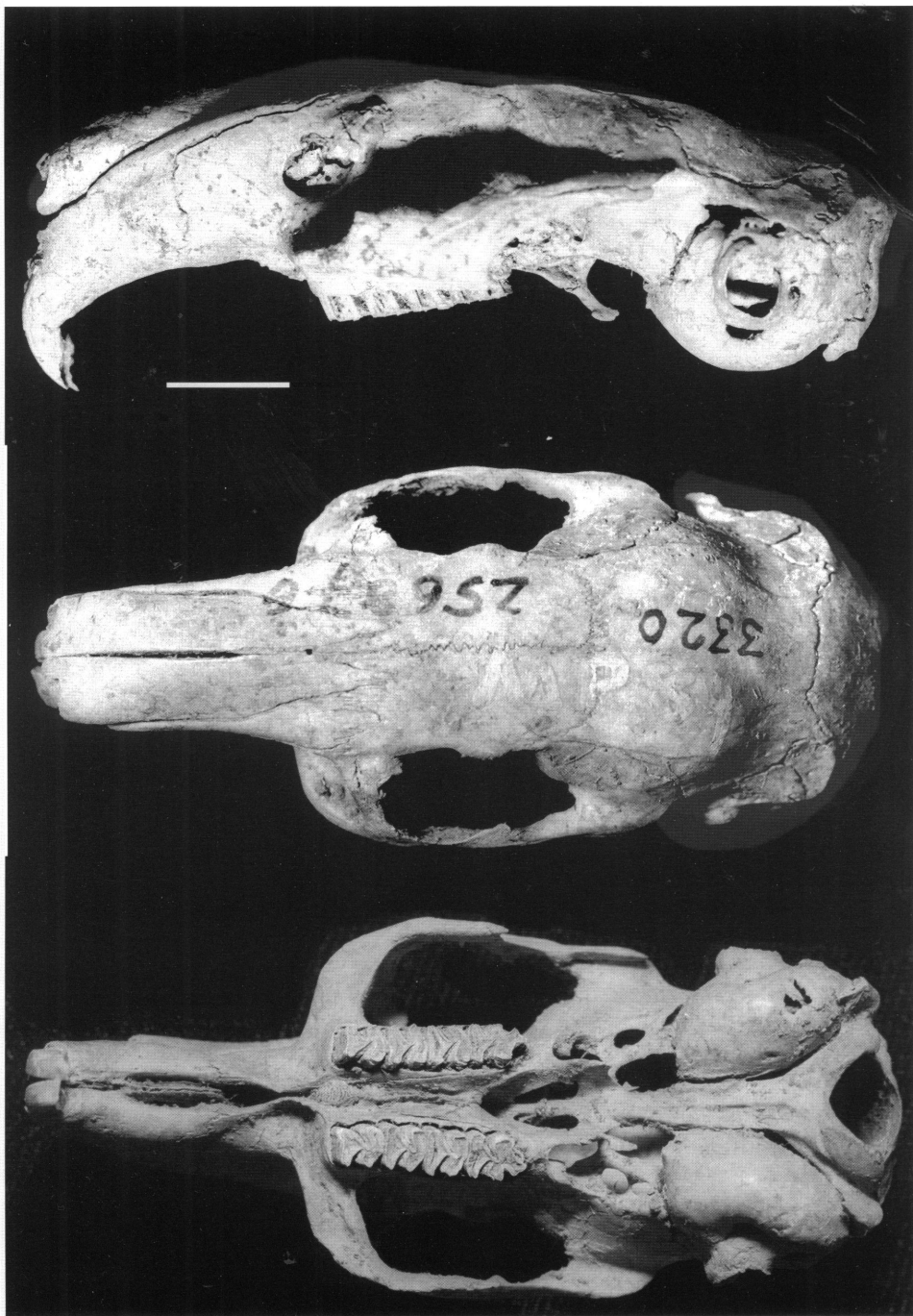


Fig. 8. Holotype of *C. oblativus*, YPM 3320.



Fig. 9. *Cuscomys oblativus*, YPM 3318.

TABLE 1  
Measurements of Three Known Crania of *Cuscomys*<sup>a</sup> spp.

	<i>C. ashaninka</i> holotype	<i>C. oblativus</i> holotype	<i>C. oblativus</i> 3318
Sex	F	?	?
GLS	66.91	63.72	63.61
ZB	30.88	27.15	27.98
PLA	29.38	30.15	29.49
IW	4.85	5.71	5.93
MB	27.06	23.43	24.06
RB	11.62	12.27	10.91
BAL	56.36	53.96	53.97
CBL	64.41	61.51	61.05
RD	13.13	13.49	—
MTR	13.23	13.55	13.61
NL	27.18	26.19	23.28
IOC	13.44	13.92	13.63
AWN	10.37	9.79	—
DL	19.77	19.44	19.01
BuL	14.80	11.89	12.78
WPM1	3.53	3.93	3.86

<sup>a</sup> GLS, greatest length of skull; ZB, zygomatic breadth at posterior root; PLA, palatal length A; IW, incisor width at alveoli; MB, breadth at mastoids; RB, breadth rostrum; BAL, basilar length of Hensel; CBL, condylobasal length; MTR, alveolar length molar toothrow; NL, greatest length of nasals; IOC, breadth of least interorbital constriction; AWN, interior width nasal bone; DL, diastema length; BuL, length tympanic bulla; WPM1, width of palate between first molars.

*Ilomys*, *Phloemys*, *Crateromys*, and *Diplothrix*, and the echimyid rodent *Callistomys pictus* (Emmons and Vucetich, 1998). In coloration (but not pelage type) it strongly resembles the similar-size arboreal echimyid, *Echimys chrysurus*.

Cranially, species of *Abrocoma* are all

smaller, e.g., mean CBL ranges from 40 mm (*A. boliviensis*) to 50 mm (*A. cinerea*, *A. bennetti*; Glanz and Anderson, 1990). *Abrocoma* spp. also contrast with one or both of the species of *Cuscomys* in the following features. They have a slender, elongated rostrum, nasals tapering to joined posterior tips and not inflated anteriorly; interorbital region with frontals widening posteriorly; dorsal projection of mastoids large and slightly inflated, mandibles with slender angular and condyloid processes; medial condyloid ridge passing posteriorly to intersect or nearly intersect posterior edge of the process; sigmoid notch relatively shorter, with a higher coronoid process (fig. 6); inferior masseteric crest, viewed from above, with sharp angle where it bends posteriorly. The posterior loph of M3 turns posteriad and consequently its posterior border is concave. The tympanic bullae range from extremely to moderately inflated, with the basioccipital correspondingly narrow, always much narrower than in *Cuscomys* spp. The palate is deeply concave, and lacks a medial ridge behind the single, large medial foramen. There is either no temporal foramen behind the postglenoid fissure, or it is minute.

DISCUSSION

Some characters of *Cuscomys* spp. seem more plesiomorphic than corresponding features of *Abrocoma* spp.; for example, the long hallux, long tail, broader rostrum, less domed palate, and smaller mastoids. The corresponding characters of *Abrocoma* spp., such as short tail, reduced hallux, slender rostrum, and hyperinflated bullae and mas-



Fig. 10. Foramen magnum: A, *C. ashaninka*, MUSM 12715, holotype; B, *C. oblativus* holotype, YPM 3320; C. *C. oblativus* holotype, YPM 3318.

toids, are a suite of likely specializations for life at high elevations or latitudes, and a terrestrial lifestyle that includes living in burrows among rocks. *Abrocoma boliviensis* is the least specialized morphologically. It has the longest tail, smallest bullae, and shortest rostrum; it is also the smallest member of the family (Anderson and Glanz, 1990).

The type locality of *C. ashaninka* (fig. 1) is the northernmost recorded for the family Abrocomidae, and both species of the genus occur north of the known range of *Abrocoma*, which just reaches southern Perú (Glanz and Anderson, 1990). *Cuscomys ashaninka* was collected about 200 km north of the Inca burials at Machu Picchu, where *C. oblativus* was discovered, but between these localities lie the deep canyons of the Urubamba and Apurímac, and the 5000 m snowcapped peaks of the Nevado de Sacsarayoc. The upper elevations of the gigantic northern Vilcabamba ridge are nearly a habitat island, with only slender habitat connections along the 3000 m contour on the northern side. The mammals we collected at 2000 and 3000 m show close affinity to the Heller collections from near Machu Picchu, but they include four or five other additional undescribed species (Emmons et al., 1999). Because of its significant size and isolation, the region is likely to have high mammalian endemism.

The tombs at Machu Picchu have recently been dated at from 1450 to 1532 A.D. (Richard Burger, personal commun.). The area surrounding Machu Picchu is precipitous and sparsely inhabited, with much remaining cloud forest. There is no evident reason for *C. oblativus* to have become extinct since 1500, and it is likely to be still extant. The Inca burials were associated with many mammalian species, including a number of domestic animals (dogs, llamas, guinea pigs; Eaton, 1916). Because *Cuscomys ashaninka* is so large and attractive (fig. 2), the question arises whether *C. oblativus* may have been kept as a pet, or even domesticated for food or amusement. One complete animal had been placed in a ceramic pot beside the human body. The long upper incisors of the two crania (figs. 9, 10), especially of YPM 3318, suggest that these individuals were captive for at least several weeks before they were killed. The tombs contained the skeletal re-

mains of whole animals, likewise implying that the rats were freshly sacrificed before burial. Because *C. oblativus* remains were found in four tombs, they were evidently fairly common. The burials included two other rarely collected cloud forest species that we encountered in the N. Vilcabamba: a dwarf brocket deer, *Mazama chunyi* (Hershkovitz, 1959) and the montane bamboo rat, *Dactylomys peruanus* (tomb specimen verified by Emmons), as well as mountain paca (*Cuniculus taczanowskii*, of which *Agouti thomasi* Eaton, 1916, is a synonym), which we did not collect. Machu Picchu hunters were evidently skilled at capturing cloud forest mammals that are not readily taken by our current collecting methods.

#### ACKNOWLEDGMENTS

The holotype of *C. ashaninka* was collected at a part of a Conservation International Rapid Assessment Program expedition. For logistical support I particularly thank Kim Awbrey and William Evans. Monica Romo both superbly organized the expedition, and was an essential partner of the mammalogy effort at 3000 m. The Ashaninka people welcomed us to their lands and gave us warm support. Drs. Richard Burger and Roger Colton provided access to the Eaton collections at Yale Peabody Museum. William Glanz kindly provided information from his notes on other Abrocomidae; Lucia Luna W. translated the abstract; and Alfred Gardner improved the manuscript with his critical review. The Smithsonian Institution, Division of Mammals, generously provided all museum and office facilities in support of Emmons' work.

#### REFERENCES

- Eaton, G. F.  
1916. The collection of osteological material from Machu Picchu. Mem. Conn. Acad. Arts Sci. 5: 1-96 + 39 pl.
- Emmons, L. H., M. Romo, and L. Luna W.  
1999. Mammals of the northern Vilcabamba. In T. Schulenberg (ed.), Biological assessments of the Cordillera Vilcabamba, Perú. RAP Working Papers 12. Washington, DC: Conservation International. In press.

- Fulk, G. W.  
1976. Notes on the activity, reproduction, and social behavior of *Octodon degus*. J. Mamm. 57: 495–505.
- Glanz, W. E., and S. Anderson  
1990. Notes on Bolivian mammals. 7. A new species of *Abrocoma* (Rodentia) and relationships of the Abrocomidae. Am. Mus. Novitates 2991: 32 pp.
- Herskovitz, P.  
1959. A new species of South American brocket, genus *Mazama* (Cervidae). Proc. Biol. Soc. Washington 72: 45–54.
- Nowak, R. M.  
1991. Walker's Mammals of the World, 5th ed., Vol. 2. Baltimore: Johns Hopkins Univ., xi + 1629 pp.
- Pearson, O. P.  
1951. Mammals in the highlands of southern Perú. Bull. Mus. Comp. Zool. 106: 117–174.
- Schulenberg, T. S. (ed.)  
1999. Biological assessments of the Cordillera Vilcabamba, Perú. RAP Working Papers, no. 12. Washington, DC, Conservation International. In press.
- Thomas, O.  
1920. Report on the Mammalia collected by Mr. Edmund Heller during the Peruvian Expedition of 1915 under the auspices of Yale University and the National Geographic Society. Proc. U.S. Natl. Mus. 58: 217–249.





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