A New Species of *Oryzomys* (Rodentia: Muridae) from an Isolated Pocket of Cerrado in Eastern Bolivia

Daniel M. Brooks  
*Houston Museum of Natural History*

R. Julieta Vargas M.  
*Colección de Boliviana de Fauna, jvargasm70@gmail.com*

Teresa Tarifa  
*Museum of Natural History*

Hugo Aranibar  
*Sección de Mamíferos*

José Manuel Rojas  
*Universidad Autónoma Gabriel René Moreno*

Follow this and additional works at: https://digitalcommons.unl.edu/museummammalogy

Part of the Zoology Commons

Brooks, Daniel M.; Vargas M., R. Julieta; Tarifa, Teresa; Aranibar, Hugo; and Rojas, José Manuel, "A New Species of *Oryzomys* (Rodentia: Muridae) from an Isolated Pocket of Cerrado in Eastern Bolivia" (2004). *Mammalogy Papers: University of Nebraska State Museum*. 144.  
https://digitalcommons.unl.edu/museummammalogy/144

This Article is brought to you for free and open access by the Museum, University of Nebraska State at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Mammalogy Papers: University of Nebraska State Museum by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
A NEW SPECIES OF ORYZOMYS (RODENTIA: MURIDAE) FROM AN ISOLATED POCKET OF CERRADO IN EASTERN BOLIVIA

DANIEL M. BROOKS, ROBERT J. BAKER, R. JULIETA VARGAS M., TERESA TARIFA, HUGO ARANIBAR, AND JOSE MANUEL ROJAS

Reliable characterization of a species is an essential step toward eventual reconstruction of phylogenetic alliances among related taxa (Musser et al. 1998). Although characterization of species within the genus Oryzomys has met with some confusion in the past, significant work has taken place to better define specific limits within this group (Musser et al. 1998; Bonvicino and Moreira 2001; Langguth and Bonvicino 2002).

In spite of several recent surveys performed in the eastern Bolivian Panhandle (Emmons 1993; Taber et al. 1997; Brooks et al. 2002), our knowledge of the mammalian fauna in this region is still incomplete, and further studies are warranted. For example, of 1,259 collecting localities in Bolivia analyzed by Anderson (1997), less than two percent are from the eastern panhandle of Santa Cruz Department. Thus, this region constitutes a priority for mammalian exploration and conservation.

In mid April 1999, during an expedition to the eastern Bolivian panhandle (Brooks et al. 2002), we collected a single specimen of the genus Oryzomys that could not be assigned to any known species previously reported for the region in former studies (e.g., Anderson 1993, 1997). Extensive morphological comparisons with deposited voucher specimens revealed that this specimen may represent an undescribed species most closely related to the O. subflavus group (Guy Musser, pers. comm.). To confirm this taxonomic hypothesis, molecular analyses using a portion of the mitochondrial cytochrome-b gene were performed to establish phylogenetic relationships. Molecular data supported our conclusion that this specimen represents a new taxon within the genus. In this study, we describe a new form of Oryzomys from the Department of Santa Cruz, Bolivia.

METHODS

The Cerrado represents a semi-deciduous savannah, comprised of a mosaic of open grassland and dry forest (Redford and da Fonseca 1986). The vegetation of this region is characteristic of a semi-humid climate (Ibish et al. 2002). Low cover is comprised of grasses and small shrubs. Tree species rarely reach high densities, and often have adaptations to water stress, such as 'twisted' trunks, deep roots, and hard,
leathery leaves (Redford and da Fonseca 1986; Ibish et al. 2002). Although Cerrado is found predominately in central Brazil, there is an isolated patch in southeastern Bolivia, acting as an island that likely promotes isolating mechanisms of speciation.

Small mammals were collected at two sites in the study region (both localities denoted with an “X” in Fig. 1), with GPS readings taken at each area. Collecting effort varied from site to site: the Las Conchas site (17°33'58.3"S; 59°28'17.1"W) included Riverine Cerrado (40 trap-nights) and typical Cerrado (100 trap-nights) habitats; the Pozo Mario site (17°35'46.9"S; 59°30'20.5"W) was comprised of a mosaic of Cerrado and savannah (260 trap-nights) vegetation. Sherman, Victor, and Museum Special traps were used to inventory small mammals. Traps were set on the ground in pairs along linear transects (trap lines), with a distance of 10 m between traps, for one to three nights in each selected microhabitat. Dry oatmeal flakes, vanilla, tuna or sardines, and peanut butter were used as bait.

Voucher specimens were deposited at Colección Boliviana de Fauna (CBF), La Paz, Bolivia.

Since the isolating mechanism driving the speciation of this form was believed to be a small island of Cerrado habitat in Santa Cruz, Bolivia (the only true Cerrado occurring outside of Brazil), we compared the specimen of the new species (CBF6151) to specimens of *O. subflavus* from Santa Cruz, Bolivia, as well as from the Brazilian Cerrado. Specimens examined are housed at AMNH (American Museum of Natural History), CMNH (Carnegie Museum of Natural History), CBF, FMNH (Field Museum of Natural History), MCZ (Harvard Museum of Comparative Zoology), NMNH (National Museum of Natural History), and OMNH (Oklahoma Museum of Natural History).

To further explore the specific affinities of this specimen, part of the mitochondrial cytochrome-\(b\) gene was sequenced. DNA was extracted from skin clip tissue using the guanidinium thiocyanate/silica extrac-

![Figure 1. Map depicting location of collecting localities (X) in southeastern Bolivia.](image-url)
The following description was prepared by Daniel M. Brooks and Robert J. Baker:

**Oryzomys andersoni, new species**

*Holotype:* CBF 6151; skull and skin of a subadult male specimen; collected by Julieta Vargas-M., field number JVM 486, on 17 April 1999.

*Type Locality:* Pozo Mario, Estancia Las Conchas, Santa Cruz, Bolivia; 17°35'46.9"S; 59°30'20.5"W; 220 m.

*Distribution:* Known only from the type locality.

**Results**

**Diagnosis:** Externally this medium-sized species is white ventrally; dorsum brownish-gray laterally, and a darkish stripe along the top. The skull has reduced foramen anterior to the auditory bullae; post-maxillary palate foramen present, mid-maxillary palate foramen absent; incisive foramen crescent shaped, yet blunt at the anterior terminus; zygomatic process of the squamosal terminates in a sharp point (Figs. 2 and 3). Differences between *Oryzomys andersoni* and *O. subflavus* are highlighted in Table 1.

**Etymology:** This species is named in honor of Sydney K. Anderson for his strong contributions to Bolivian Mammalogy. Dr. Anderson's studies of Bolivian mammals have spanned over three decades.
**DISCUSSION**

**DESCRIPTION AND COMPARISONS**

*Pelage*— *Oryzomys andersoni* is a medium-sized species within the genus and overall color is brownish-gray; dorsum has a darker brown, diffuse stripe from the rostrum to the tail, becoming increasingly dark towards the posterior end; ventrum is white; bases of the hairs are dark charcoal throughout dorsal and ventral regions; head has same color as dorsum; feet are covered with sparse white hair and are lighter colored; dorsal side of the tail is a dark, charcoal color above; ventral side of the tail is lighter, becoming increasingly darker towards the distal tip, which has few hairs; ears are darker brown exteriorly (matching the dorsal stripe), and lighter grayish-brown interiorly (matching the sides, and overall dorsal pelage) (Fig. 2).

*Oryzomys andersoni* can be distinguished externally from *O. subflavus* by the following characters: *O. subflavus* from Santa Cruz Bolivia tend to have more tawny sides, whereas *O. subflavus* from the Brazilian Cerrado tend to be tawny throughout (*O. andersoni* is brownish-gray overall). Additionally, *O. subflavus* from Santa Cruz, Bolivia tend to have a tawny ventrum (*O. andersoni* has a whitish ventrum).

*External Measurements*—Measurements of holotype skin taken during preparation are as follows (mm): total length = 233, tail length = 122, pes = 30, ear = 17; weight (g) = 37.

*Skull*—Skull elongate and slightly convex; bullae small and smooth; zygomatic process of the squamosal terminates in a sharp point; incisive foramen is crescent shaped, and blunt at the anterior terminus; vomerine process well developed; post-maxillary palatine foramen present; reduced foramen anterior to the auditory bullae.

*Skull Measurements*—Measurements of holotype skull taken as follows (mm): greatest length of skull = 29, zygomatic breadth = 15, length of nasals = 11, length of upper toothrow = 4.6, length of incisive foramen = 5.6 (Fig. 3).

*Genetics*—Based on comparisons of the first 219 bp of the mitochondrial cytochrome-\(b\) gene, this specimen groups with *O. subflavus* and is closest aligned to an unidentified specimen from Brazil (*O. sp. nov. 3, AF181277*). These clades were present in parsimony, likelihood, and neighbor-joining analyses, although the position of specimens within the clades differed. The parsimony tree with bootstrap values is shown in Figure 4. Percent sequence divergence values ranged from 0.92% to 16.05% (Table 2) within this group. Following the criteria and principles outlined in Bradley and Baker (2001), as they pertain to
Figure 3. Skull of the holotype of *Oryzomys andersoni* (CBF 6151). Photographs are at different levels of enlargement. Relative size can be obtained by the following measurements: greatest length of skull 29; zygomatic breadth 15; length of nasal 11; length of upper toothrow 4.6; and length of incisive foramen 5.6. Photos by Mark Mauthner.
Table 1 – Character differences between Oryzomys andersoni and O. subflavus.

<table>
<thead>
<tr>
<th>Foramen anterior to auditory bullae</th>
<th>O. andersoni</th>
<th>O. subflavus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-maxillary palatine foramen</td>
<td>reduced</td>
<td>tends to be prominent</td>
</tr>
<tr>
<td>Mid-maxillary palatine foramen</td>
<td>absent</td>
<td>tends to be reduced or absent</td>
</tr>
<tr>
<td>Incisive foramen</td>
<td>more crescent shaped</td>
<td>tends to be present, but reduced</td>
</tr>
<tr>
<td>Zygomatic process of squamosal</td>
<td>terminates in sharper point</td>
<td>straighter, with more pointed tips</td>
</tr>
<tr>
<td>Ventrum</td>
<td>white</td>
<td>more rounded at termination</td>
</tr>
<tr>
<td>Dorsum</td>
<td>brownish-gray sides</td>
<td>tends to be more tawny</td>
</tr>
</tbody>
</table>

the genetic species concept (Dobzhansky 1950), the holotype of O. andersoni exhibits a genetic divergence from the O. subflavus clade, similar to those that separate other currently recognized species of rodents (Bradley and Baker 2001). Although we sequenced only 219 base pairs of the cytochrome-b gene, the addition of the sequence values for the remainder of the gene will undoubtedly change the distance values slightly. The distance values distinguishing O. andersoni from O. subflavus are sufficiently high that slight changes in distance values will not alter conclusions relative to the specific recognition based on the genetic species concept.

ECOLOGY

Habitat – This holotype was captured in Cerrado (see general description above), in a transitional mosaic between dense and high savannah, with open forest. The ground cover contained some dead leaves and 30-40% gramineae cover.

Sympatric Mammals – Other species of small mammals trapped at the site include singletons of Monodelphis domestica and Proechimys longicaudatus. Larger rodents observed in the region included Sciurus spadieeus, Galea spixii and Dasyprocta puntata. Other species of mammals that were common included Dasy­pus novemcinctus, Cerdogyon thous, Mazama gouazoubira and M. americana (Brooks et al. 2002).
Table 2 – Percent sequence divergence values between O. andersoni (CBF6151), O. subflavus, and five unidentified specimens from Brazil. The Kimura 2-parameter model of evolution (Kimura 1980) was used to calculate genetic distances.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Percent Sequence Divergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>O. andersoni (CBF6151)-O. subflavus (AF181274)</td>
<td>11.46%</td>
</tr>
<tr>
<td>O. andersoni (CBF6151)-O. sp. nov. 3 (AF181277)</td>
<td>5.25%</td>
</tr>
<tr>
<td>O. andersoni (CBF6151)-O. sp. nov. 5 (AF181279)</td>
<td>13.78%</td>
</tr>
<tr>
<td>O. andersoni (CBF6151)-O. sp. nov. 4 (AF181278)</td>
<td>13.73%</td>
</tr>
<tr>
<td>O. andersoni (CBF6151)-O. sp. nov. 1 (AF181276)</td>
<td>14.27%</td>
</tr>
<tr>
<td>O. andersoni (CBF6151)-O. sp. nov. 2 (AF181275)</td>
<td>11.46%</td>
</tr>
<tr>
<td>O. sp. (AF181277)-O. subflavus (AF181274)</td>
<td>8.80%</td>
</tr>
<tr>
<td>O. sp. (AF181277)-O. sp. (AF181279)</td>
<td>12.15%</td>
</tr>
<tr>
<td>O. sp. (AF181277)-O. sp. (AF181278)</td>
<td>10.42%</td>
</tr>
<tr>
<td>O. sp. (AF181277)-O. sp. (AF181276)</td>
<td>11.49%</td>
</tr>
<tr>
<td>O. sp. (AF181277)-O. sp. (AF181275)</td>
<td>7.75%</td>
</tr>
<tr>
<td>O. sp. (AF181279)-O. subflavus (AF181274)</td>
<td>13.73%</td>
</tr>
<tr>
<td>O. sp. (AF181279)-O. sp. (AF181278)</td>
<td>8.33%</td>
</tr>
<tr>
<td>O. sp. (AF181279)-O. sp. (AF181276)</td>
<td>16.05%</td>
</tr>
<tr>
<td>O. sp. (AF181279)-O. sp. (AF181275)</td>
<td>12.58%</td>
</tr>
<tr>
<td>O. sp. (AF181278)-O. subflavus (AF181274)</td>
<td>9.26%</td>
</tr>
<tr>
<td>O. sp. (AF181278)-O. sp. (AF181276)</td>
<td>12.51%</td>
</tr>
<tr>
<td>O. sp. (AF181278)-O. sp. (AF181275)</td>
<td>9.26%</td>
</tr>
<tr>
<td>O. sp. (AF181276)-O. subflavus (AF181274)</td>
<td>6.21%</td>
</tr>
<tr>
<td>O. sp. (AF181276)-O. sp. (AF181275)</td>
<td>7.23%</td>
</tr>
<tr>
<td>O. sp. (AF181275)-O. subflavus (AF181274)</td>
<td>0.92%</td>
</tr>
</tbody>
</table>

ACKNOWLEDGMENTS

Kind thanks to Guy Musser for comments on the specific status of the taxon described herein. Additionally, Duane Schlitter was very helpful in providing methods for distinguishing diagnostic characters. Mark Mauthner took the professional skull photos and Yunzhong Hou expertly prepared draft skull drawings. Kind thanks to two anonymous referees who significantly improved the manuscript. We are grateful to the following museums and associated staff for loaning comparative material: N. Simmons and J. Spence (AMNH), M. Carleton and L. Gordon (NMNH), S. McLarens (CMNH), J. Braun and M. Revelez (OMNH), B. Patterson (FMNH) and J. Chupasko (MCZ). Additionally, we thank J. Dines (Los Angeles County MMH) for providing measurements and a photograph of the specimen from Maranhão, and M. Carleton and H. Daniels for providing reprints of applicable studies. We gratefully acknowledge CBF and Museo de Historia Natural Noel Kempff Mercado for loaning capture equipment. Special thanks go to ENTRIX, Inc., particularly Bob Honig, for helping to facilitate the fieldwork.
LITERATURE CITED


APPENDIX 1 — SPECIMENS EXAMINED

BOLIVIA: Santa Cruz: AMNH 246934, 255954, 260378-260388, 262073, 262076, 263342-263343; CBF 6151; CMNH 4989, 5006; NMNH 390667, 390669-390672, 390674-390678, 391305, 304605; BRAZIL: Brasilia: OMNH 17581, 17582, 17584; Goias: MCZ 34053; Maranhao: FMNH 26446; Mato Grosso do Sul: OMNH 19656; Minas Gerais: NMNH 304605; Piaui: FMNH 25246
Publications of the Museum of Texas Tech University

Institutional subscriptions are available through the Museum of Texas Tech University, attn: NSRL Publications Secretary, Box 43191, Lubbock, TX 79409-3191. Individuals may also purchase separate numbers of the Occasional Papers directly from the Museum of Texas Tech University.

ISSN 0149-175X

Museum of Texas Tech University, Lubbock, TX 79409-3191