

Nota



MISCELLANY ON *Bibimys* (RODENTIA, SIGMODONTINAE), A UNIQUE AKODONTINE CRICETID

Ulyses F. J. Pardiñas¹, Damián Voglino², and Carlos A. Galliari³

¹Instituto de Diversidad y Evolución Austral (IDEAus-CONICET), Puerto Madryn, Chubut, Argentina.

[Correspondence: Ulyses Pardiñas <ulyses@cenpat-conicet.gob.ar>]

²Museo de Ciencias Naturales Antonio Scasso, Don Bosco 580, San Nicolás de los Arroyos, Buenos Aires, Argentina.

³Centro de Estudios Parasitológicos y de Vectores (CEPAVE-CONICET-UNLP), La Plata, Buenos Aires, Argentina.

ABSTRACT. We comment on the geographical distribution of the 3 recognized species of *Bibimys*, focusing in the type species, *B. torresi*. By briefly reviewing the fossil occurrence of this form we posit that the species suffered a very recent marked retraction. Based on few collected individuals belonging to *B. chacoensis* and *B. torresi*, we describe some external traits, such as their unique mammary dotation composed by 2 pairs located more caudally, 1 of them laterally to the genitalia. Combining morphology with direct observation of a wild individual we advance that *Bibimys* is not a fossorial or semi-fossorial form but a specialized sigmodontine focused on the active search for food employing mostly the nose.

RESUMEN. Miscelánea sobre *Bibimys* (Rodentia, Sigmodontinae), un cricétido akodontino único. Comentamos sobre la distribución geográfica de las 3 especies reconocidas de *Bibimys*, con énfasis en la especie tipo, *B. torresi*. Revisando brevemente su registro fósil postulamos que dicha especie sufrió una marcada retracción reciente. Sobre la base de unos pocos individuos colectados pertenecientes a *B. chacoensis* y *B. torresi*, describimos algunos rasgos externos como la dotación mamaria compuesta por 2 pares localizados más atrás en el cuerpo, 1 de ellos lateralmente a la genitalia. Combinando morfología con observaciones directas de un individuo en libertad postulamos que *Bibimys* no es una forma fosorial o semifosorial sino un sigmodontino especializado en la búsqueda activa de alimento empleando mayormente la nariz.

Key words: Akodontini. Anatomy. *Bibimys chacoensis*. *Bibimys torresi*. Distribution. Holocene.

Palabras clave: Akodontini. Anatomía. *Bibimys chacoensis*. *Bibimys torresi*. Distribución. Holoceno.

Although the Argentinean mammalogist Elio Massoia (1936-2001) first “discovered” *Bibimys* in 1963 studying materials derived from owl pellets (E. Massoia, pers. comm. to UFJP in 1985), he spent about 2 decades to obtain trapped individuals. With 3 captured animals

he named the genus and described the type species, *Bibimys torresi* (see Massoia, 1979). However, the action of this scholar was even more ample (Massoia, 1980) because he successfully connected the newly erected *Bibimys* with 2 previous and enigmatic nominal forms

of the species group, from Brazil and from northeastern Argentina, both restricted by that time to their holotypes (*Scapteromys labiosus* Winge, 1887 and *Akodon chacoensis* Shamel, 1931, respectively). By the same time, Massoia (1983) documented the first notice on *Bibimys* populations in southern Misiones province, Argentina. Therefore, in about 5 years, a new cricetid was introduced to the sigmodontine radiation, having this genus 3 species and covering about 15° of latitude in eastern tropical and subtropical South America. Up to date, despite several contributions added to the knowledge of *Bibimys* (Pardiñas et al., 2015 and the references cited therein), the basic scenario delineated by Massoia (1979, 1983) of the 3 poorly known species remains mostly unchanged. Some issues about this rodent, such as soft anatomy, breeding, behavior, diet, among other aspects, are virtually unexplored.

Bibimys was the last member of the tribe Akodontini described from unnamed animals. The entire history of this genus is marked by the scarcity of trapped specimens. In fact, *B. labiosus* was described on an animal collected by Peter Lund in the first half of the XIX century (Winge, 1887); the second trapped and fully studied specimen was obtained 150 years later (Gonçalves et al., 2005). The case of *B. chacoensis* runs in the same line: it was first described from a specimen collected in 1920 by P. Wetmore (Shamel, 1931) and redescribed from a new collected animal in 2005 (D'Elía et al., 2005). These sporadic additions, in time and space, coupled with small samples available in collections, surely favored the currently accepted alpha-taxonomy of the genus (Pardiñas et al., 2015).

The goal of this note is to contribute to the knowledge of *Bibimys* in several aspects. Probably both the title and the contents of this work look like an old-fashioned paper. However, we are convinced that this genus exemplifies a case in which, in order to advance and to promote the interest of other scholars, the publication of miscellaneous results derived from small samples is justified.

The present contribution was based on the study of a few individuals (**Appendix 1**). Despite our efforts trapping in a variety of habitats,

we only secured 2 specimens; in addition, we obtained 2 new animals collected by colleagues. Additionally, we explored some aspects of the bone anatomy using material retrieved from owl pellets. Several anatomical terms employed in this note were taken from Reig (1977; dental nomenclature), Carleton (1980; soft anatomy) and Voss (1988; general cricetid anatomy).

The type species of the genus, *B. torresi* Massoia, 1979, is today paradoxically the least known (for example, there is only 1 published photograph of a skull belonging to this species; see Nowak and Paradiso, 1983:599). According to Massoia (1979:1) the holotype was secured in the Estación Experimental Agropecuaria (EEA) del INTA Delta del Paraná (34°10' S and 58°51' W); the buildings of this experimental station are located on the left (north) margin of the Paraná de las Palmas River, about 10 km downstream of Campana. Massoia (1979:3) recorded a second locality for *torresi* as "... confluencia del arroyo Las Piedras con el arroyo Cucarachas;" this place (34°09' S and 58°47' W) was adopted incorrectly as type locality by Honacki et al. (1982:400; see also Pereira et al., 2003:128). Few records were added posteriorly to the range of the species; apparently, all of them belong to island places in the Delta del Paraná (**Fig. 1**). A putative exception is the record published by Pereira et al. (2003) for Reserva Natural Otamendi; it was based on material derived from an owl pellet sample collected and studied by M. Lezcano (see Pardiñas, 1999). Although this sample was obtained near Laguna Grande and, therefore, in the heart of the Reserva Natural Otamendi, the possibility that the single specimen of *B. torresi* recorded came from the neighboring island territory cannot be totally discarded. In contrast, the record for Otamendi indicated by Dyzenchauz and Massarini (1999) is directly incorrect; the 3 animals karyotyped by these authors were collected by M. I. Sánchez López and collaborators at the type locality (cf. Bonaventura et al., 1991). The materials derived from owl pellets reported as "Canal 6" by Massoia et al. (1989) have the same provenance. In fact, this channel is about 1 km downstream of the type locality. Finally, the record given as Establecimiento "Las Carabelas" (34°10' S and 58°44' W) associated

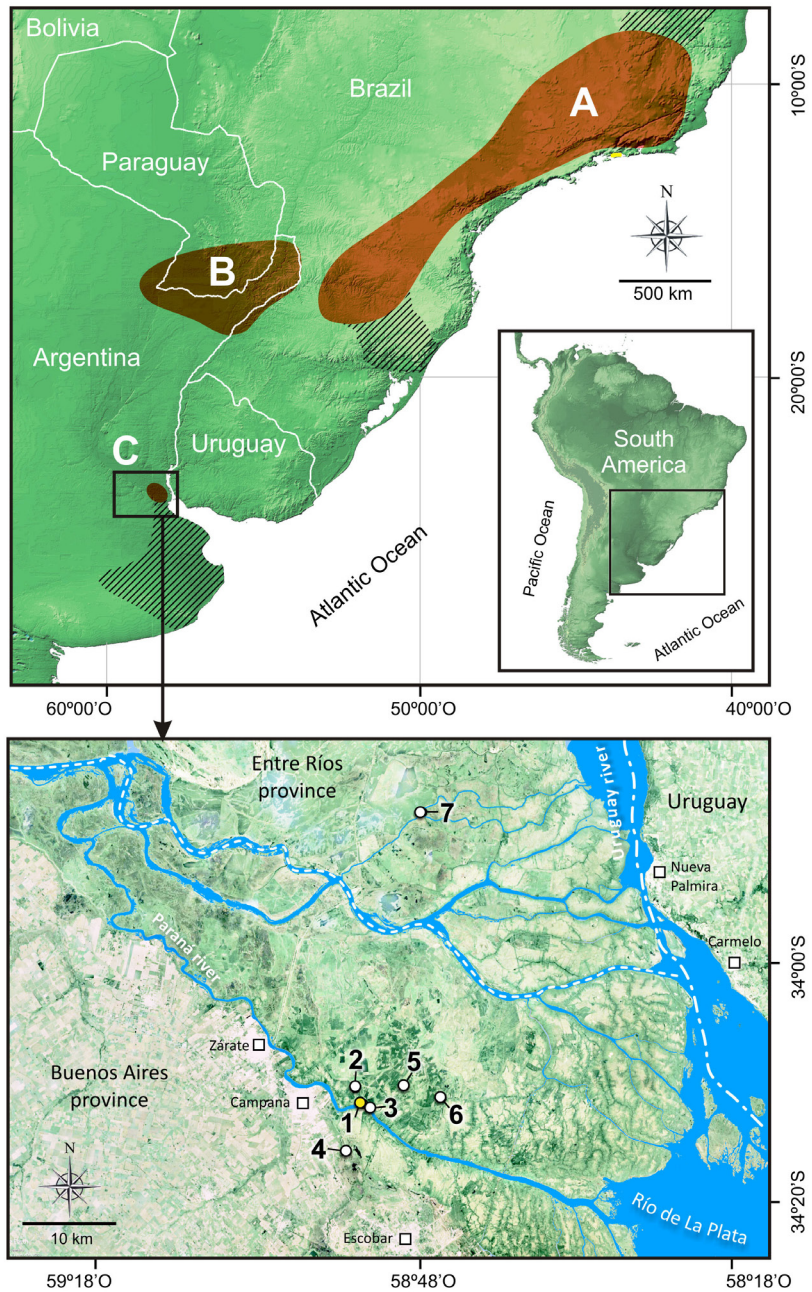


Fig. 1. Upper panel: Current (shading) and past (lined) geographic ranges for the 3 recognized species of *Bibimys*: A) *B. labiosus*; B) *B. chacoensis*; C) *B. torresi*. Lower panel: current recording localities for *B. torresi* in Delta del Paraná. References: 1) EEA del INTA Delta del Paraná (type locality); 2) 2.3 km NNW EEA del INTA Delta del Paraná; 3) Canal 6; 4) Otamendi Natural Reserve near Laguna Grande; 5) Confluencia arroyo Las Piedras y Cucarachas; 6) Establecimiento “Las Carabelas;” 7) Confluencia Brazo Largo y Brazo Chico.

to the San Fernando County (Pardiñas et al., 2015) is incorrect, since this locality belongs to the County of Campana and it is near the type locality. In summary, the known localities for *B. torresi* are very few and mostly located in the vicinities of the type locality. The single exception is the record for the confluence of Brazo Largo and Brazo Chico (33°48' S and 58°46' W; Massoia, 1983), which extends the distribution of this rodent about 40 km NNE from its terra typica.

However, the fact that is beyond doubt is that *B. torresi* had a huge range across Buenos Aires Province in the recent past (e.g., Pardiñas, 1995, 1999, 2000; Scheifler et al., 2012). Late Holocene occurrences for this rodent are numerous and eloquent to confirm that the species reached southerly 38°S (in the locality of Centinela del Mar, Buenos Aires, Argentina; Pardiñas, 1999) and westerly 60°W (in the archaeological site of Calera, Buenos Aires, Argentina; Scheifler et al., 2012). During the Late Holocene, *B. torresi* occupied an area of ca. 120 000 km², about one third of the total surface of the Buenos Aires Province. In addition, the younger occurrences in this past distribution are so recent (about 3 centuries ago; Pardiñas, 1995, 2000) that is hard to imagine the magnitude and speed of the regional environmental change capable to trigger the range contraction suffered by *B. torresi*. Moreover, in contrast to its recent low abundance, this rodent was relatively abundant in the recent past. For example, in the rich assemblage recorded at the archaeological site “El Divisadero Monte 6” (near the southern border of Samborombón Bay, Buenos Aires, Argentina), *B. torresi* has a relative abundance of about 7% in a total sample of 301 sigmodontine cranial remains (representing 12 species; see Teta et al., 2013). A comparable frequency is displayed by this rodent in the assemblage of Calera, an open-air archeological site located approximately at the western portion of the Tandilia range system (Scheifler et al., 2012). Conversely, relative frequencies derived from recent owl pellet samples are very low (**Supplementary 1, Table S1**). Hence, *B. torresi* clearly lost territory and also suffered an ecological decline as a component of the small mammal assemblages. In a context of rapid retraction,

the persistence of relictual isolated populations is nonetheless possible. For example, a current record originally referred to *B. torresi* as coming from Central-East Buenos Aires Province was discarded (Pardiñas, 1996). However, the coastal fringe of Samborombón Bay, a flooding area of about 150 km in length, seems prima facie a suitable area to host this rodent. J. Bianchini (pers. comm. to UFJP in 1993) trapped there an unidentified sigmodontine that was karyotypically studied by P. Kiblicky, although never published, obtaining a diploid complement of >60 chromosomes. Probably this animal was a true *Bibimys*; according to Dyzenchouz and Massarini (1999), who first reported a karyotype for the genus, *B. torresi* has a 2n=70. The coastal environments of Samborombón Bay were never consistently sampled with respect to small mammals.

Several new records recently published partially changed the traditional scenario of 3 species with small ranges separated by large territory gaps. Actually, only *B. torresi* has a small area of distribution. Thanks to the new records reported for Brazil and Paraguay (e.g., D'Elía et al., 2008; Grazzini et al., 2015), both *B. chacoensis* and *B. labiosus* have their ranges virtually parapatric (**Fig. 1**). *B. chacoensis* is recorded in an arc bordering the north limit of the large combined wetlands of Ñeembucú and Iberá, running from eastern Chaco to the west, through southern Paraguay to southern-central Misiones and northeastern Corrientes to the east (Pardiñas et al., 2015). *B. labiosus*, even discarding some individuals misidentified by Diório (2014: figures 5, 6, 9, among others), has been recorded in Brazilian localities from Rio Grande do Sul in the south to Minas Gerais in the north (**Fig. 1**). Interestingly, this latter species also suffered a recent contraction of its geographic range. According to the stratigraphical record of several archaeological sites in Rio Grande do Sul, *B. labiosus* was a moderately abundant element during most of the Holocene (e.g., Hadler et al., 2016). In parallel, the genus has extralimital records in Quaternary assemblages from the Brazilian state of Bahia (P. Hadler, pers. comm. to UFJP). Therefore, is safe to say that *B. labiosus* also lost important portions of its range during the Late Holocene.

Cranially *Bibimys* calls attention by the combination of a short rostrum with a rounded and enlarged braincase (Fig. 2); this pair of traits is unique among living akodontines (see also D'Elía et al., 2005; Gonçalves et al., 2005). Both Winge (1887) and Shamel (1931) highlighted the dominating appearance of the neurocranium in this rodent. However, several akodontines (e.g., *Lenoxus*, *Oxymycterus*), an also other non-akodontine sigmodontines (e.g., *Neomicroxus*, some abrotrichines), have rounded enlarged braincases, although typically combined with pointed enlarged rostra. The short rostrum of *Bibimys* is characterized by a well-developed hook-shaped gnathic process (Fig. 3A). The infra-orbital foramen is ovoid with a basal portion unusually ample (Fig. 3B); when cleaning manually the CNP 6067 (*B. torresi*) we detected a thick bundle traversing the ventral part of this foramen. Frontal sinuses are unique in *Bibimys*, because they are ample and internally delimited by a frontal crest but not inflated or rounded as is typical in akodontines (Fig. 3C). In the zygomatic arch (Fig. 3G), *Bibimys* is characterized by a broad maxillary portion, a large jugal which conforms the outer wall of the glenoid cavity (Fig. 3H), and a squamosal root posteriorly linked with the hamular process of the squamosal by a continuous ridge (Fig. 3D). In this portion of the skull another singularity is present; apparently both *B. chacoensis* and *B. torresi* lack the suspensory process of the squamosal that in most sigmodontines contacts the tegmen tympani; in addition, the latter structure displays a variable development (Fig. 3D). Coupled with the enlarged braincase,

the foramen magnum is huge (Fig. 3E; see also Massoia, 1979). In turn, pterygoids are small and not winged (Fig. 3F). The mandible of *Bibimys* looks impressive by the combination of a wide and triangular coronoid process, a bulbous capsular projection located anteriorly (Fig. 3J) and an excavated angular process crossed by a single transverse crest (Fig. 3I).

The singularity of *Bibimys* is not restricted to its cranial anatomy. It is 1 of the few cricetids to have a mammary dotation (first reported here based on CNP 1891, *B. chacoensis*; Fig. 3) composed by 2 pairs located to the rear of the

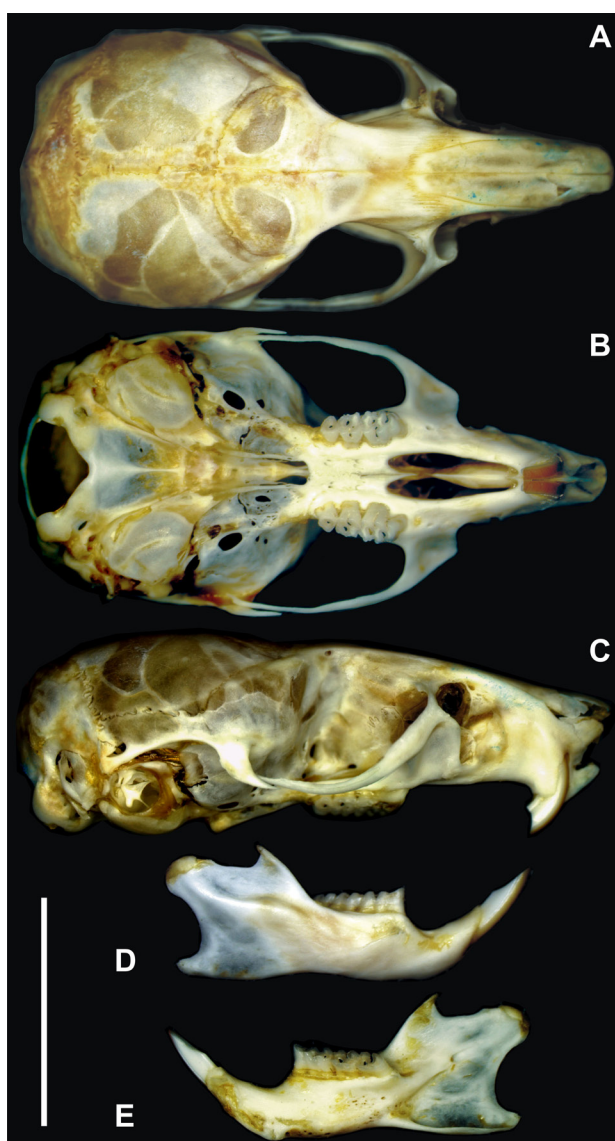


Fig. 2. *Bibimys torresi* (CNP 6067; Delta del Paraná, Buenos Aires, Argentina), skull in dorsal (A), ventral (B) and lateral (C) view, and right mandible in labial (D) and lingual (E) view. Scale = 10 mm.

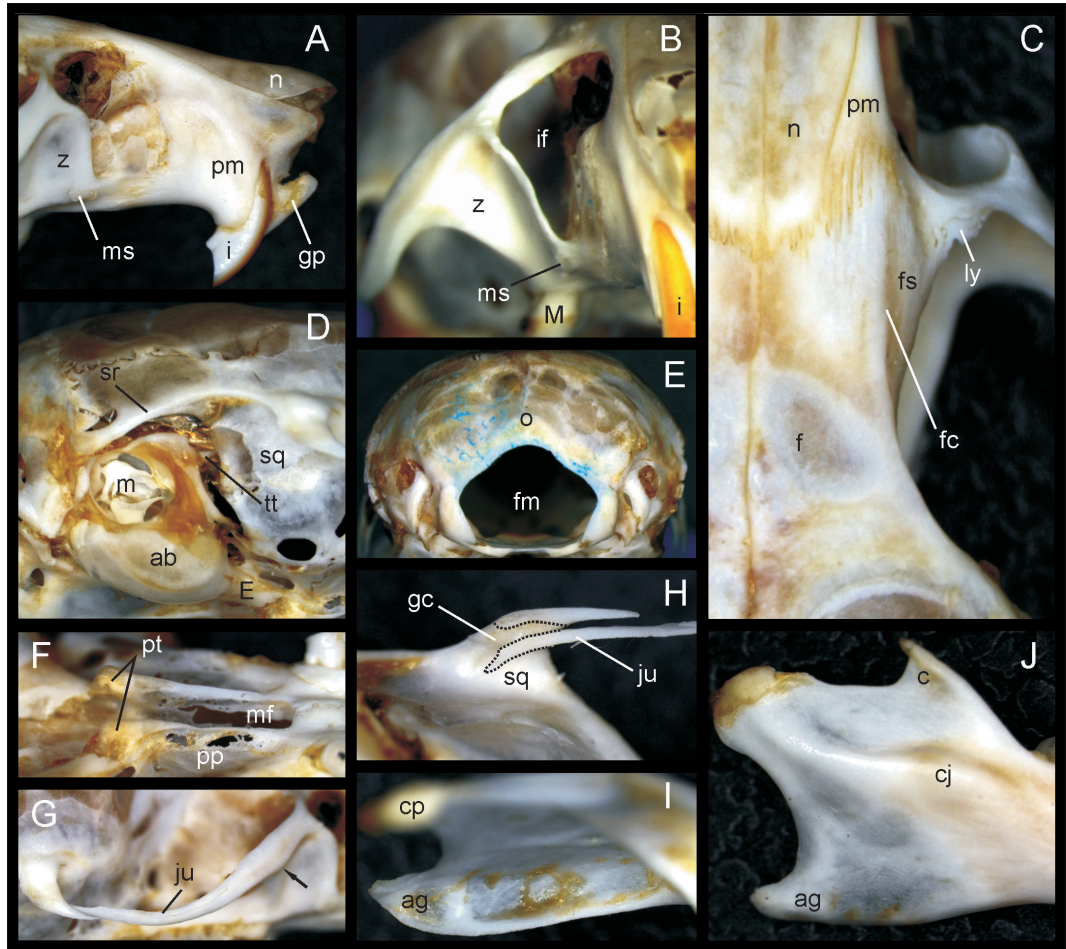


Fig. 3. Selected anatomical details on the skull and mandible of *Bibimys torresi* (CNP 6067; Delta del Paraná, Buenos Aires, Argentina): A. Rostrum in lateral view; B. Rostrum in anterior view; C. Right interorbital region in dorsal view; D. Temporal region in lateral view; E. Occipital region in posterior view; F. Basal region in ventral view; G. Zygomatic arch in external view (arrow points the anterior expansion); H. Squamosal articular region in ventral view; I. Angular shelf in dorsal view; J. Vertical ramus in labial view. Abbreviations: ab=auditory bulla; ag=angular process; c=coronoid process; cj=capsular projection; cp=condyloid process; f=foramen magnum; f=frontal; fc=frontal crest; fs=frontal sinus; gc=glenoid cavity; gp=gnathic process; i=incisor; if=infraorbital foramen; ju=jugal; ly=lacrimal; m=malleus; M=molar; ms=maseteric scar; ms=mesopterygoid fossa; n=nasal; o=occipital; pm=premaxillary; pp=parapterygoid plate; pt=pterygoids; sq=squamosal; sr=squamosal ridge; tt=tegmen tympani; z=zygomatic plate.

body. These mammae can be equated to the pairs abdominal and inguinal (cf. Voss and Carleton, 1993:fig. 8), being both so posteriorly displaced that the latter pair looks “vaginal” (Fig. 4). Soft palate (in *B. torresi*, CNP 6067; **Supplementary 2, Fig. S1**) has 3 diastemal and 4 interdental palatal rugae; in our count of the former we include an anterior ruga that could be alternatively interpreted as the

anterior border of the interdiastemal palate and, hence, not a typical ruga (cf. figures and text in Myers et al., 1990:25-26). The interdental ruga 3 does not reach the palate midline. Both *B. chacoensis* (based on CNP 756 and CNP 1891) and *B. torresi* (CNP 6067) shares a hemiglandular-unilocular stomach, although the glandular portion is notably small (**Supplementary 3, Fig. S2**); the same pattern

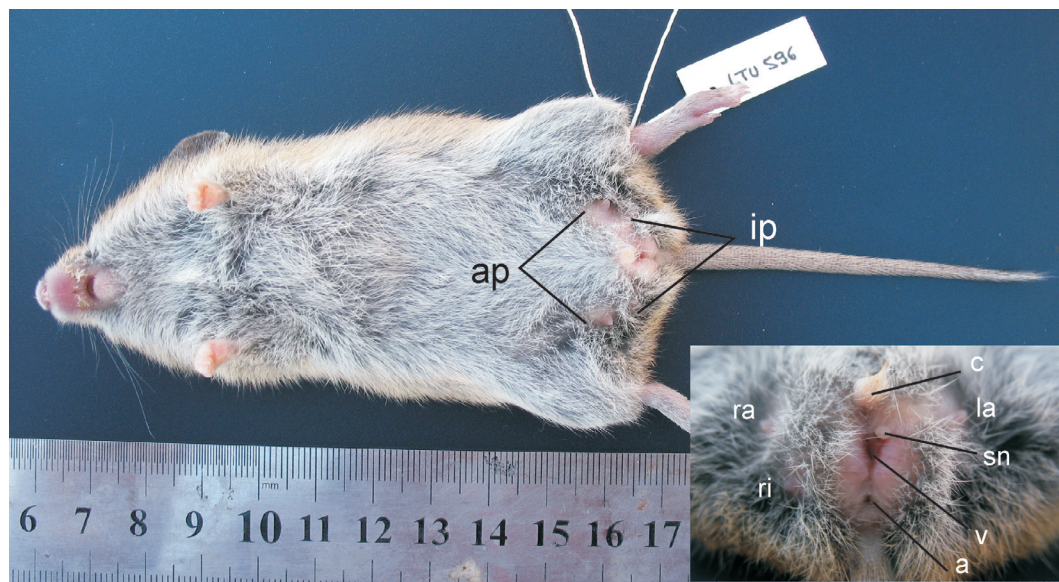


Fig. 4. Ventral view of an adult female of *Bibimys chacoensis* (CNP 1891; 7 km S Puerto Las Palmas, Chaco, Argentina) showing mammary dotation. Inset: detail of the genital region in caudal view. Abbreviations: a = anus; ap = abdominal pair; c = clitoris; ip = inguinal pair; la = left abdominal nipple; ra = right abdominal nipple; ri = right inguinal nipple; sn = supernumerary nipple; v = vagina.

was reported for *B. labiosus* (Gonçalves et al., 2005). No gall bladder was found in specimens CNP 756 (*B. chacoensis*) and CNP 6067 (*B. torresi*); in contrast, the scrutiny of the CNP 1891 (*B. chacoensis*) revealed a minute structure placed between lobules 3 and 4 of the liver than can be equated with a gall bladder. A gall bladder was recorded as present in *B. labiosus* (based on 2 individuals; see Gonçalves et al., 2005) and also listed as a feature in the generic diagnosis constructed by D'Elía et al. (2005). Both intraspecific and intrageneric variation have been recorded in akodontines regarding this organ (see Geise et al., 2004).

A final issue we want to briefly discuss is the life style of *Bibimys*. Since its original description several authors attributed to these mice “fossorial” or “semi-fossorial” habits (e.g., Massoia, 1979; Pardiñas, 1996). However, it is hard to imagine any fossorial strategy for a terrestrial rodent living in periodically flooded areas, a widespread feature of the ranges occupied by both *B. chacoensis* and *B. torresi*. Even with a restricted view of requirements of a fossorial lifestyle, it is clear that *Bibimys* is not a fossorial

rodent. However, some anatomical traits displayed by this rodent can be associated mostly with adaptations to a feeding behavior based on the active search on ground surface and to root in litter and the upper part of the soil. The amazing and unique “pink” nose of *Bibimys* seems a delicate structure with sensory function (**Supplementary 4-5, Videos S1-S2**). The poorly developed manual and pedal claws depart from the expectation for a true fossorial rodent (see the discussions in Hershkovitz, 1966 and Pearson, 1984), but can be associated to general digging activities. Finally, the poor development of mystacial vibrissae suggests reduced participation in searching activities. There is no information about diet for *Bibimys*. However, the moderate degree of hipsodonty displayed by this rodent can be linked to the consumption of an important quantity of hard green material.

The phylogenetic position of *Bibimys* is still a matter of controversy (D'Elía et al., 2005; Pardiñas et al., 2015). Most of the data here commented highlighted its singularity among the akodontine radiation (see also Gonçalves

et al., 2005). However, dental morphology in *Bibimys* is very close to those of *Kunsia* and *Gyldenstolpia* (Pardiñas, 1996; Pardiñas et al., 2008 [2009]). Akodontini is in need of a deep revision; fortunately, this task is in progress (C. Cañón, pers. comm.) and the potential results illuminating the intergeneric relationships of *Bibimys* and associated taxa are exciting.

Acknowledgments. This contribution was possibly thanks to several scholars that donated to our collection the animals trapped, including personal of the Instituto Nacional de Enfermedades Virales Humanas “Dr. Julio I. Maiztegui” and L. Antoniazzi, P. Beldomenico and J. Pereira. Material from Contreras Collection was kindly loaned by Y. Davies. J. Pereira and N. Fracassi freely shared data. J. Notarnicola, M. Lareschi, R. Robles and J. Sánchez assisted in the several field trips performed; also J. Notarnicola deserves the merit in obtaining the movies presented here as supplementary material. Funds for the cabinet research were derived from PICT (Agencia) 2014-1039 (to UFJP). We really appreciate the help received from the above-mentioned persons and institutions.

LITERATURE CITED

- BONAVENTURA SM, MJ PIANTANIDA, L GURINI and MI SÁNCHEZ LÓPEZ. 1991. Habitat selection in population of cricetine rodents in the region Delta (Argentina). *Mammalia* 55:339-354.
- CARLETON MD. 1980. Phylogenetic relationships in neotomine-peromyscine rodents (Muroidea) and a reappraisal of the dichotomy within New World Cricetinae. *Miscellaneous Publications, Museum of Zoology, University of Michigan* 157:1-146.
- D'ELÍA G, UFJ PARDIÑAS and P MYERS. 2005. An introduction to the genus *Bibimys* (Rodentia: Sigmodontinae): phylogenetic position and alpha taxonomy. Pp. 211-246, in: *Mammalian diversification: from chromosomes to phylogeography. A celebration of the career of James Patton* (EA Lacey and P Myers, eds.). University of California Press, Berkeley.
- D'ELÍA G, I MORA, P MYERS and R OWEN. 2008. New and noteworthy records of Rodentia (Erethizontidae, Scuridae, and Cricetidae) from Paraguay. *Zootaxa* 1784:39-57.
- DIÓRIO DG. 2014. Análise da espécie *Bibimys labiosus* (Winge 1887) (Rodentia, Sigmodontinae) ao longo da sua distribuição geográfica no Brasil. Master dissertation, Universidade Federal de Ouro Preto, Minas Gerais, Brazil.
- DYZENCHAUZ FJ and AI MASSARINI. 1999. First cytogenetic analysis of the genus *Bibimys* (Rodentia, Cricetidae). *Zeitschrift für Säugetierkunde* 64:59-62.
- GEISE L, M WEKSLER and C BONVICINO. 2004. Presence or absence of gall bladder in some Akodontini rodents (Muridae, Sigmodontinae). *Mammalian Biology* 69:210-214.
- GONÇALVES PR, JA OLIVEIRA, M OLIVEIRA CORRÊA and LM PESSOA. 2005. Morphological and cytogenetic analyses of *Bibimys labiosus* (Winge, 1887) (Rodentia, Sigmodontinae): implications for its affinities with the scapteromyine group. Pp. 175-210, in: *Mammalian diversification: from chromosomes to phylogeography. A celebration of the career of James Patton* (EA Lacey and P Myers, eds.). University of California Press, Berkeley.
- GRAZZINI G, JA REZINI, BS BORASCHI DOS SANTOS, FJ VENÂNCIO, F GATTO-ALMEIDA, IJ SBALQUEIRO, I HASS and LM TIEPOLO. 2015. *Bibimys labiosus* Winge, 1887 (Mammalia: Rodentia: Sigmodontinae): new records in Paraná state, southern Brazil, and update of the known geographic distribution. *Check List* 11(3), 1632.
- HADLER P, J CHEREM, R TURBAY, A ALBERTI and UFJ PARDIÑAS. 2016. Diversidade de pequenos mamíferos (Didelphimorphia e Rodentia) do Holoceno do nordeste do estado do Rio Grande do Sul, Brasil: implicações taxonômicas e paleoambientais. *Revista Brasileira de Paleontologia* 19:127-144.
- HERSHKOVITZ P. 1966. South American swamp and fossorial rats of the scapteromyine group (Cricetinae, Muridae) with comments on the glans penis in murid taxonomy. *Zeitschrift für Säugetierkunde* 31:81-149.
- HONACKI JH, KE KINMAN and JW KOEPL (Eds.) 1982. *Mammal species of the World, a taxonomic and geographic reference*. Allen Press, Kansas.
- MASSOIA E. 1979. Descripción de un género y especie nuevos: *Bibimys torresi* (Mammalia, Rodentia, Cricetidae, Sigmodontinae, Scapteromyini). *Physis*, C 38:1-7.
- MASSOIA E. 1980. El estado sistemático de cuatro especies de cricétidos sudamericanos y comentarios sobre otras especies congénéricas. *Ameghiniana* 17:280-287.
- MASSOIA E. 1983. La alimentación de algunas aves del orden Strigiformes en la Argentina. *El Hornero*, Número Extraordinario pp. 125-148.
- MASSOIA E, SI TIRANTI and MP TORRES. 1989. La depredación de pequeños mamíferos por *Tyto alba* en Canal 6, Delta bonaerense, partido de Campana, provincia de Buenos Aires. *Boletín Científico, Asociación para la Protección de la Naturaleza* 13:14-19.
- MYERS P, JL PATTON and MF SMITH. 1990. A review of the *boliviensis* group of *Akodon* (Muridae: Sigmodontinae), with emphasis on Peru and Bolivia. *Miscellaneous publications, Museum of Zoology, University of Michigan* 177:1-104.
- NOWAK RM and JL PARADISO. 1983. *Walker's mammals of the World*. Volume 2. Fourth Edition, The Johns Hopkins University Press, Baltimore.
- PARDIÑAS UFJ. 1995. Nuevos cricétidos (Mammalia, Rodentia) en el Holoceno de la Región Pampeana, Argentina. *Ameghiniana* 32:197-203.
- PARDIÑAS UFJ. 1996. El registro fósil de *Bibimys* Massoia, 1979 (Rodentia). Consideraciones sobre los Scapteromyini (Cricetidae, Sigmodontinae) y su distribución durante el Plioceno-Holoceno en la región pampeana. *Mastozoología Neotropical* 3:15-38.

- PARDIÑAS UFJ. 1999. Los roedores muroideos del Pleistoceno tardío-Holoceno en la región pampeana (sector este) y Patagonia (República Argentina): aspectos taxonómicos, importancia bioestratigráfica y significación paleoambiental. Doctoral Dissertation, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Buenos Aires, Argentina.
- PARDIÑAS UFJ. 2000. Micromamíferos y paleoambientes del Holoceno en el sudeste de la provincia de Buenos Aires (Argentina): el caso de Cueva Tixi. Cuaternario y Ciencias Ambientales, Publicación Especial 4:31-36.
- PARDIÑAS UFJ, G D'ELÍA and P TETA. 2008 [2009]. Una introducción a los mayores sigmodontinos vivos: revisión de *Kunsia* Hershkovitz, 1966 y descripción de un nuevo género (Rodentia: Cricetidae). Archivos do Museu Nacional (Rio de Janeiro) 66:509-594.
- PARDIÑAS UFJ, G D'ELÍA and P TETA. 2015. Genus *Bibimys* Massoia, 1979. Pp. 204-208, in: Mammals of South America, Volume 2 - Rodents (JL Patton, UFJ Pardiñas and G D'Elía, eds.). The University of Chicago Press, Chicago.
- PEARSON OP. 1984. Taxonomy and natural history of some fossorial rodents of Patagonia, southern Argentina. Journal of Zoology (London) 202:225-237.
- PEREIRA J, E HAENE and M BABARSKAS. 2003. Mamíferos de la Reserva Natural Otamendi. Pp. 115-139, in: Fauna de Otamendi. Inventario de los animales vertebrados de la Reserva Natural Otamendi (Campana, Provincia de Buenos Aires, República Argentina) (E Haene and J Pereira, eds.). Temas de Naturaleza y Conservación, 3. Aves Argentinas - Asociación Ornitológica del Plata, Buenos Aires.
- REIG OA. 1977. A proposed unified nomenclature for the enamelled components of the molar teeth of the Cricetidae (Rodentia). Journal of Zoology (London) 181:227-241.
- TETA P, UFJ PARDIÑAS, M SILVEIRA, V ALDAZABAL and E EUGENIO. 2013. Roedores sigmodontinos del sitio arqueológico "el Divisadero Monte 6" (Holoceno tardío, Buenos Aires, Argentina): taxonomía y reconstrucción ambiental. Mastozoología Neotropical 20:171-177.
- SCHEIFLER NA, P TETA and UFJ PARDIÑAS. 2012. Small mammals (Didelphimorphia and Rodentia) of the archaeological site Calera (Pampean region, Buenos Aires province, Argentina): Taphonomic history and Late Holocene environments. Quaternary International 278:32-44.
- SHAMEL HH. 1931. *Akodon chacoensis*, a new cricetine rodent from Argentina. Journal of Washington Academy of Sciences 21:427-429.
- VOSS RS. 1988. Systematics and ecology of ichthyomyine rodents (Muroidea): patterns of morphological evolution in small adaptive radiation. Bulletin of the American Museum of Natural History 188:262-493.
- VOSS RS and MD CARLETON. 1993. A new genus for *Hesperomys molitor* Winge and *Holochilus magnus* Hershkovitz, with comments on phylogenetic relationships and oryzomyine monophyly. American Museum Novitates 3085:1-39.
- WINGE H. 1887. Jordfundne og nulevende Gnavere (Rodentia) fra Lagoa Santa, Minas Geraes, Brasilien. E Museo Lundii 1(3):1-178 + 18 plates.

APPENDIX 1

Specimens studied in this contribution belong to following collections: Colección de Mamíferos and Colección de Material de Egagrópilas y Afines "Elio Massoia" del Centro Nacional Patagónico (CNP and CNP-E, respectively; Puerto Madryn, Chubut, Argentina), Colección de Mamíferos del Museo Municipal de Ciencias Naturales y Tradicional de Mar del Plata "L. Scaglia" (MMP-Ma; Mar del Plata, Buenos Aires, Argentina), Colección Elio Massoia y familia (CEM; acquired by the Fundación de Historia Natural Félix de Azara, Buenos Aires, Argentina), Colección Julio Contreras (C; acquired by the Fundación de Historia Natural Félix de Azara, Buenos Aires, Argentina).

Bibimys chacoensis (n=16). Argentina, Chaco Province: 7 km S Puerto Las Palmas (27° 9' 40.36" S and 58° 40' 27.54" W), CNP 1891, a lactating female collected by C. Galliari on May 29, 2008; Escuela José Zubiaur, Cancha Larga (27° 4' 36.8" S and 58° 43' 50.9" W), CNP 756, a scrotal male collected by C. Galliari and U. Pardiñas on July 7, 2000; Paso Mono, Las Palmas (27° 02' S and 58° 39' W), C-01580, an adult male collected by A. Contreras and Y. Davies on December 13, 1984. Misiones Province, Leandro N. Alem (27° 35' S and 55° 20' W), CNP 792, a scrotal male collected by INEVH on May 19, 2004; Misiones (exact locality not known), CEM 6963, an adult male collected by E. Massoia; Estancia Santa Inés (27° 31' S and 55° 51' W), CNP-E 187, cranial remains from owl pellets collected by S. Cirignoli and U. Pardiñas on March 15, 2001; Campo Viera (27° 19' S and 55° 03' W), CEM 10110, 10117, 10126, 10133, 10137, cranial remains from owl pellets collected by J.C. Chebez and S. Heinonen Fortabat.

Bibimys torresi (n=3). Argentina, Buenos Aires Province, 2.3 km NNW EEA del INTA Delta del Paraná (34° 9' 23.41" S and 58° 52' 23.45" W), CNP 6067, an adult male collected by L. Antoniazzi and P. Beldomenico on September 5, 2011; EEA del INTA Delta del Paraná (34° 10' S and 58° 51' W), CEM 5067 (holotype; skin renumbered as C-005391), an adult male collected by E. Massoia, A. De Simone, E. Torres and A. Torres on December 15, 1975; MMP Ma 3705, an adult male collected by M. I. Sánchez López on November 10, 1989.

SUPPLEMENTARY ONLINE MATERIAL

Supplement 1: Table S1. Relative abundance of *Bibimys torresi* in owl pellet assemblages recorded in Delta del Paraná area, Buenos Aires Province, Argentina.

https://www.sarem.org.ar/wp-content/uploads/2017/06/SAREM_MastNeotrop_24-1_Pardinas-sup1.docx

Supplement 2: Fig. S1. *Bibimys torresi* (CNP 6067; Delta del Paraná, Buenos Aires, Argentina): A. Soft palate in ventral view; B. Soft palate in lateral view; C. Anterior portion of the tongue in dorsal view. Abbreviations: d1 = diastemal ruga 1; d2 = diastemal ruga 2; d3 = diastemal ruga 3; in = incisor; M1 = first upper molar; r1 = palatal ruga 1; r2 = palatal ruga 2; r3 = palatal ruga 3; r4 = palatal ruga 4.

https://www.sarem.org.ar/wp-content/uploads/2017/06/SAREM_MastNeotrop_24-1_Pardinas-sup2.jpg

Supplement 3: Fig. S2. Stomach anatomy of an adult female of *Bibimys chacoensis* (CNP 1891; 7 km S Puerto Las Palmas, Chaco, Argentina). A. External appearance in ventral view; B. Partially dissected (note the small antrum cavity); C. Totally dissected (“butterfly”).

https://www.sarem.org.ar/wp-content/uploads/2017/06/SAREM_MastNeotrop_24-1_Pardinas-sup3.jpg

Supplements 4-5: Video S1-Video S2. Videos taken in wild after trapping of an adult female of *Bibimys chacoensis* (CNP 1891; 7 km S Puerto Las Palmas, Chaco, Argentina) May 29, 2008.

https://www.sarem.org.ar/wp-content/uploads/2017/06/SAREM_MastNeotrop_24-1_Pardinas-sup4.avi

https://www.sarem.org.ar/wp-content/uploads/2017/07/SAREM_MastNeotrop_24-1_Pardinas-sup5.avi