NOTAS SOBRE

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Small mammals in owl pellets from the Arid Chaco of Córdoba province (Argentina), including the first records of *Microcavia jayat* (Rodentia, Caviidae) for the province

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ABSTRACT
A short list of small mammals is provided, from bones found in pellets of the American barn owl (*Tyto furcata*) collected in four localities in the Arid Chaco of Córdoba province, central Argentina. We identified seven species and one genus belonging to two orders (Didelphimorphia and Rodentia) and four families (Didelphidae, Cricetidae, Ctenomyidae and Caviidae). We also present the first records of *Microcavia jayat* Teta, Ojeda, Lucero & D'Elia, 2017 for Córdoba province.

RESUMEN
Se detalla una breve lista de micromamíferos, a partir de restos óseos encontrados en egagrópilas de Lechuza de campanario (*Tyto furcata*) en cuatro sitios del chaco árido de la provincia de Córdoba, República Argentina. Se identificaron en total siete especies y un género pertenecientes a dos órdenes (Didelphimorphia y Rodentia) y cuatro familias (Didelphidae, Cricetidae, Ctenomyidae y Caviidae). Además, presentamos los primeros registros de *Microcavia jayat* Teta, Ojeda, Lucero & D'Elia 2017, para la provincia de Córdoba.

The Chaco ecoregion is known for its biological richness (The Nature Conservancy et al. 2005), but knowledge of its small mammal fauna is still fragmentary and geographically biased. Most systematic surveys were done in the Humid Chaco, while very scarce surveys were conducted in the Dry Chaco (D´Hiriart et al. 2017). Reflecting this general trend, few small mammal surveys in Chacoan environments were done in Córdoba province, only east of the Sierras de Córdoba mountain range (Altrichter et al. 2004; Kufner et al. 2005; Cebollada Putz et al. 2012). Instead, no survey was conducted west of this mountain range which is the most arid portion of the Dry Chaco. The objective of this note is to provide a list of terrestrial small mammals consumed by the American barn owl (*Tyto furcata*), from the analysis of pellets collected during 2017 and 2018 in four sites in western Córdoba province (Fig.

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1): 1) Baños de Unquillo (BU; latitude -30.196120; longitude -65.018300; Ischilín department). Around this site, located at the border of the great saline named Salinas Grandes, vegetation is composed by halophytic shrublands with *Maytenus vitis-idaea, Suaeda divaricata, Allenrolfea patagonica, Atriplex* spp., and *Cyclolepis genistoides* as the dominant species, and zones with bare ground; 2) La Pintada (LP; latitude -30.998320; longitude -65.472497; Minas department). This area is covered by well-preserved Chacoan forests, with *Aspidosperma quebracho-blanco* as the emergent tree, *Prosopis chilensis, P. flexuosa, Sarcomphalus mistol,* and *Cercidium praecox* in the arboreal stratum, *Vachellia aroma, Larrea divaricata, Senegallia gilliesii, S. praecox,* and *Mymozyganthus carinatus* in the shrub stratum, and cactus, bromeliads, forbs, and grasses in the lower stratum; 3) Árbol Blanco (AB; latitude -30.148538; longitude -64.725413; Ischilín department). The area is covered by Chacoan secondary forests, where emergent trees and trees in the arboreal stratum are scarce, while the shrub stratum is very dense; 4) 11 km NNE from Quilino (QU; latitude -30.120069; longitude -64.559657; Ischilín department). An area with patches of forest alternating with implanted pastures.

We used the dry method to extract bones from the collected pellets (Muñóz Pedreros & Rau 2020). Taxonomic identification of cranial elements was made with the help of specific keys and several bibliographic sources (Fernández et al. 2011, 2012; Patton et al. 2015; Teta et al. 2017; Udrizar Sauthier et al. 2020). We analyzed 58 pellets (2 from BU, 11 from LP, 17 from AB, and 28 from QU), plus several isolated bone elements found in disaggregated pellets in QU. The recovered elements are housed in the mammal collection of the Museo de Zoología, Universidad Nacional de Córdoba (MZUC), Córdoba city, Argentina.

We identified seven species and one genera in two orders (Didelphimorphia and Rodentia) and four families (Didelphidae, Cricetidae, Caviidae and Ctenomyidae; Table 1 and Fig. 2). While some species (e.g., *Calomys musculinus*) are generalists commonly found in diverse habitats and others (e.g., *Graomys chacoensis*) are typical of Chacoan ecosystems, the presence of *Galea leucoblephara* in halophytic shrublands in BU was remarkable, as the species is commonly found living in grasslands (Dunnum 2015). In the case of *Thylamys*, remains found in BU (both partially complete mandibles) were insufficient to correctly identify them at the species level. The distribution of a *Thylamys* species related to *T. pallidior* (probably *T. bruchi*, following Albanese & Martin 2019) reaches southwestern Córdoba province and also covers the mountain ranges, while the northern species *T. pulchellus* inhabits only Chacoan forests (Torres 2018a). Given the environment around BU, the remains of *Thylamys* could be assigned to *T. bruchi,* since other records in halophytic habitats already exist for this species, also from Salinas Grandes. However, it is unknown to what extent the distribution of this species overlaps with that of *T. pulchellus* in the Arid Chaco; thus we prefer to mention it as *Thylamys* sp. until we have a better understanding of the distributions of both species. In the case of skulls of *Ctenomys*, they were provisionally assigned to *Ctenomys* cf. *C. bergi* given the proximity to confirmed localities for the species. This hypothesis is supported by the similar characteristics observed in live

individuals in the studied localities, which are similar to those described by Thomas (1902). Besides, no other species of *Ctenomys* has been recorded for northeastern Córdoba (Torres 2018b). We also found similar craniometric measurements from an almost complete adult skull from QU with the holotype (data not showen). Despite this, the final identification requires a more comprehensive taxonomic analysis using morphology, molecular and ecological analyses, as the full distributional range of the species is currently ignored (Torres 2018b).

The records of *Microcavia jayat* in two localities (AB y LP) stand out for being the first of this species in Córdoba province. Through morphological analysis, Teta et al. (2017) recently proved that what was previously considered a single species (*M. australis*) typical of the arid lowlands of central and western Argentina (Roach 2016), is actually a complex of three species (*M. australis*, *M. maenas* and *M. jayat*). One of these species, *M. maenas*, in addition to inhabiting the Monte ecoregion, also inhabits the Arid Chaco, reaching western Córdoba. Another species, *M. jayat*, was a new undescribed species endemic to the Chaco region and hypothesized to inhabit northern Córdoba province (Teta et al. 2017). There are still several unconfirmed records for this new species, with six locations in Santiago del Estero province (five mentioned in Teta et al. 2017, plus two individuals from Suncho Corral, housed at American Museum of Natural History [collection numbers 41587 and 41590; P. Teta pers. comm.]), and a recent record for La Rioja province (Bustamante et al. 2020; Fig. 1). In addition, there are two more localities in Santiago del Estero with records of *Microcavia* that could be assigned to this species, due to habitat similarity and proximity with confirmed records (Est. El Salvador, Choya department, Michigan State University, collection numbers 14177 to 14181, and 14190; and Choya, Choya department, Quintana 1996), and three other possible localities from observations in Santa Fe province (Contreras 1966; Pautasso 2008). In the present work, we recovered eight partially complete crania and mandibles of *Microcavia jayat*, apparently from juvenile specimens, given the degree of development of the palatal cristae and the palatal bone suture, and the small size of the skulls compared to those described by Teta et al. (2017). All diagnostic characters of *M. jayat* could be identified: relatively flattened dorsal profile of the skull; inferior process of the jugal bone posteriorly extended beyond the border of the glenoid fossa; widely expanded zygomatic arches angled towards their middle portion, with a conspicuous paraorbitary process formed exclusively by the jugal bone; and suture between palatines occupied by a heart-shaped palatal crista, that posteriorly surpasses the posterior border of the palate, which is subtrapezoidal. This last character showed a "drop shape" in the skulls from Córdoba, probably because the development of these structures is not yet complete (Fig. 3). The presence of this species in the Dry Chaco of Córdoba province has been suggested based on the proximity and environmental continuity with nearby provinces, where the species has been confirmed (Teta et al. 2017; Bustamante et al. 2020). In Córdoba *M. maenas*, more typical of the Monte ecoregion, was confirmed in one locality in the Chaco Serrano in the western portion of the province (Teta et al. 2017), which is one of the easternmost localities reported for the species, and distant about 140 km south from the closest record of *M. jayat* in

Córdoba (LP). Although it could be a marginal record for the species, there is a chance that in western Córdoba (and also in eastern La Rioja and Catamarca, and in western Santiago del Estero provinces) *M. maenas* could be sympatric with *M. jayat*. Instead, the observations of *Microcavia* in two localities in Chacoan environments east of Sierras de Córdoba mountain range (Kufner et al. 2005) could probably be referred to *M. jayat*. In any case, individuals collected throughout a broader area are necessary to clarify the limits in the distribution of both species in the dry Chaco.

This report contributes to the knowledge of small terrestrial mammal distributions in the dry Chaco, especially for *Microcavia jayat*, a Chacoan endemism whose distributional range is largely unknown. The fast conversion of forest and shrubs into croplands and pastures experimented by Chacoan forests in northern Córdoba (Hoyos et al. 2013) could represent a threat for this species. Therefore, understanding the species full distributional range becomes an urgent goal, as an input for the implementation of conservation measures.

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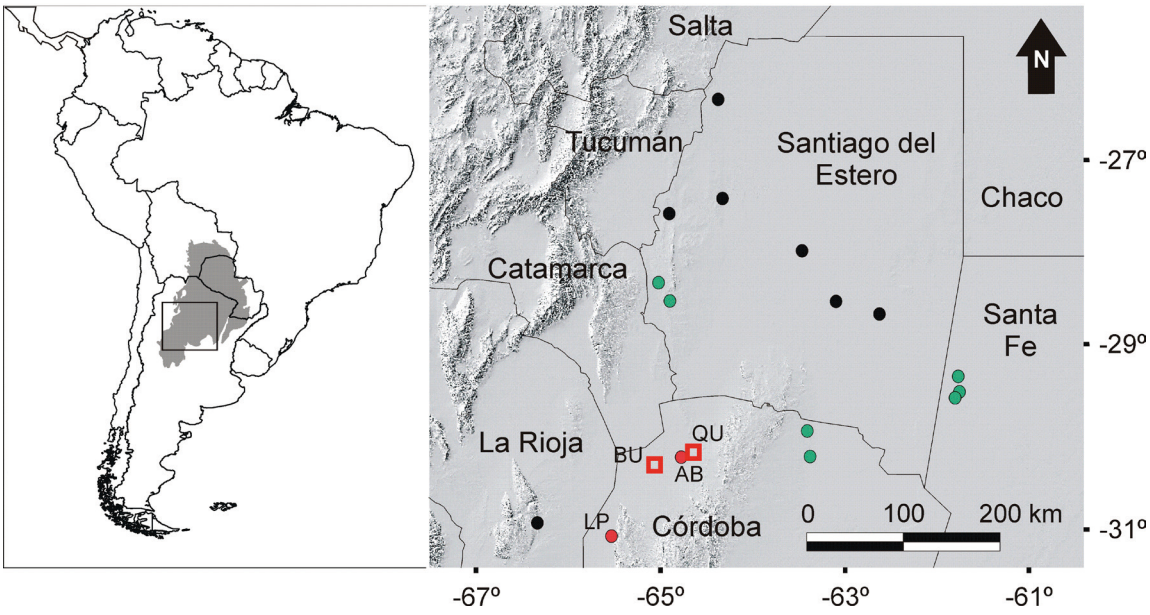

Figure 1. Location of the study area in Argentina and South America, with the Gran Chaco region shaded in gray. Black circles= known confirmed localities for *Microcavia jayat;* red circles= new localities reported in this work; green circles= localities with records of *Microcavia* assignable to *M. jayat* (see text); open red squares= other localities mentioned in text; BU= Baños de Unquillo; AB= Árbol Blanco; QU= 11 km NNE from Quilino; LP= La Pintada.

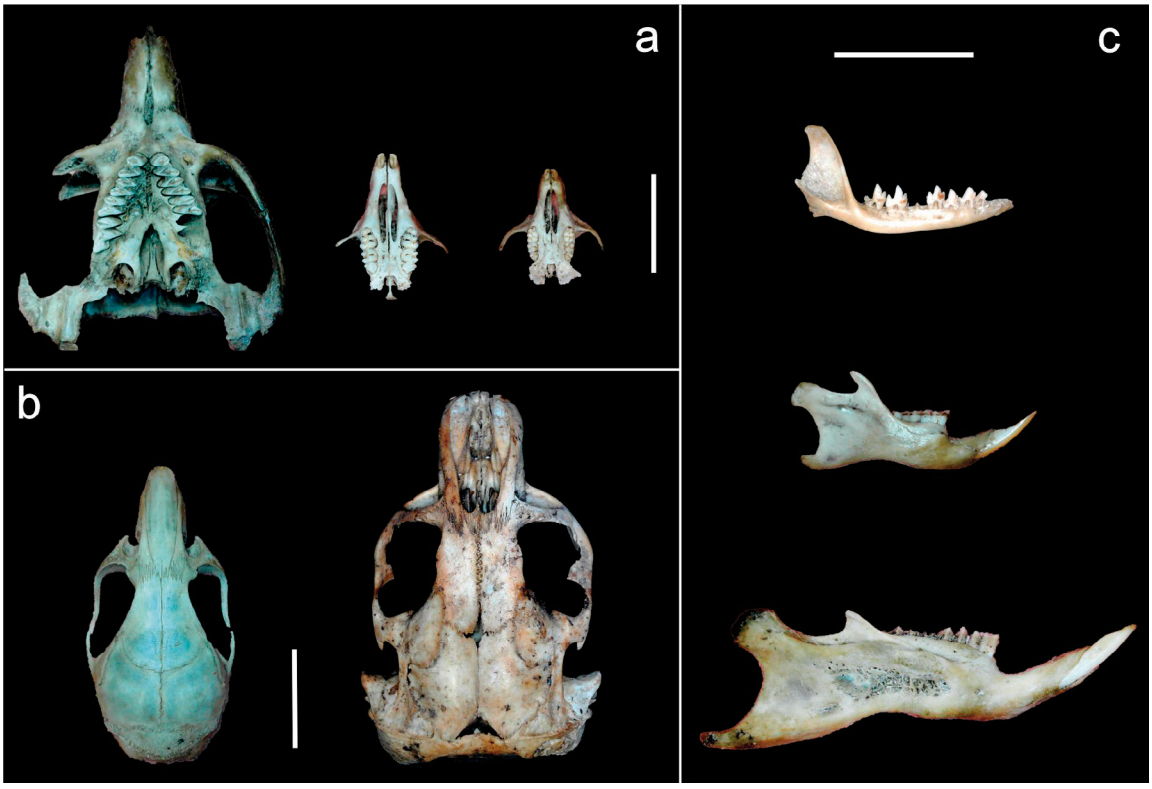

Figure 2. Crania and mandibles of species collected at different sites of Córdoba province, Argentina. a) From left to right, ventral view of *Galea leucoblephara* (MZUC-I01491), *Akodon* cf. *A. azarae* (MZUC-I01519) and *Calomys* cf. *C. laucha-C. musculinus* (MZUC-I01492); b) from left to right, dorsal view of *Graomys chacoensis* (MZUC-I01497) and *Ctenomys* cf. *C. bergi* (MZUC-I01527); c) from top to bottom, right mandibles of *Thylamys* sp. (MZUC-I00457), *Akodon* cf. *A. dolores* (MZUC-I01520), and *Microcavia jayat* (MZUC-I01502). Scale bar= 10 mm.

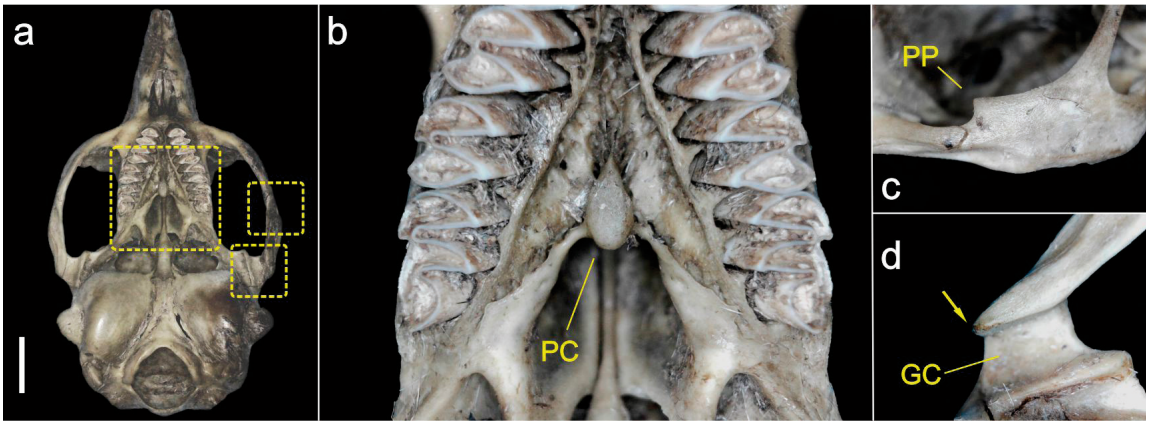

Figure 3. Ventral view of a crania of Microcavia jayat from La Pintada, Minas department (MZUC-I01482), and detail of its diagnostic characters. a) General ventral view; b) palatal section; the posterior limit of palatal cristae exceeds the posterior margin of the palate; c) paraorbital process; d) detail of the inferior process of the jugal bone, posteriorly extended relative to the glenoid fossa. PP: paraorbital process; GC: glenoid cavity; PC: palatal cristae. Scale Bar= 5 mm.

Table 1. Small mammals identified in *Tyto furcata* pellets within the Arid Chaco of Córdoba province, Argentina. Locality references: BU= Baños de Unquillo; AB= Árbol Blanco; QU= 11 km NNE from Quilino; LP= La Pintada.

Taxa	Locality	Collection number
Didelphidae		
Thylamys sp.	BU	MZUC-I00457
Cricetidae (Sigmodontinae)		
Akodon cf. *A. azarae*	QU	MZUC-I01519
Akodon cf. *A. dolores*	LP, QU	MZUC-I01483, MZUC-I01520
Calomys cf. *C. laucha-musculinus*	AB, QU	MZUC-I01492, MZUC-I01524
Graomys chacoensis	AB, QU	MZUC-I01497, MZUC-I01525
Caviidae		
Galea leucoblephara	AB, LP, QU, BU	MZUC-I01495, MZUC-I01491 MZUC-I01526, MZUC-I00456
Microcavia jayat	LP, AB	MZUC-I01479, MZUC-I01582 MZUC-I01485, MZUC-I01506 MZUC-I01487, MZUC-I01508 MZUC-I01489, MZUC-I01590 MZUC-I01502
Ctenomyidae		
Ctenomys cf. *C. bergi*	AB, QU	MZUC-I01518, MZUC-I01527

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