



MARCUS VINICIUS
BRANDÃO DE
OLIVEIRA

**Taxonomy and systematics of
species of the tribe Akodontini
(Rodentia: Cricetidae) from
Western Brazil**

Taxonomia e sistemática de espécies da tribo
Akodontini (Rodentia: Cricetidae) do Oeste do
Brasil

Volume I

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Advisor: Prof. Dr. Alexandre Reis Percequillo

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Dedico esta Tese a minha mãe, a maior responsável por eu ser quem sou.

RESUMO

A tribo Akodontini abrange 16 gêneros e 91 espécies. Embora amplamente distribuída na América-do-Sul, está ausente na maior parte do Chile e sul da Patagônia, e poucas espécies ocorrem na Amazônia. As relações filogenéticas desta tribo, bem como a delimitação de novos gêneros e espécies, tem sido reveladas através de revisões sistemáticas e estudos moleculares. No entanto, para vários táxons, grande parte da representação geográfica ainda não foi investigada. É o caso de *Akodon* e *Thalpomys*, gêneros filogeneticamente próximos e com padrões de diversificação distintos: 42 e duas espécies, respectivamente. No Brasil ocorrem principalmente nas regiões leste e central, ocupando áreas de Mata Atlântica e Cerrado. Os registros e o status taxonômico dos membros desses gêneros no oeste do Brasil, em áreas de transição entre a Amazônia, Cerrado e Pantanal, raramente foram abordados em estudos sistemáticos. Este projeto teve como objetivos: i)_delimitar e caracterizar os táxons de *Akodon* e *Thalpomys*, com enfoque nos exemplares do oeste do Brasil, ii)_estimar as relações filogenéticas entre as espécies de cada gênero e, conseqüentemente, iluminar parte da história evolutiva da tribo Akodontini. A diversidade de ambos os gêneros foi investigada sob uma abordagem integrativa a partir de análises cariológicas, morfológicas, morfométricas e moleculares. O estudo dessas populações de *Akodon* permitiu reconhecer duas novas espécies, que descrevemos como *A. diauarum*, endêmico das florestas de transição Amazônia/Cerrado do Mato Grosso e Pará, e *A. kadiweu*, endêmico das florestas secas do Mato Grosso do Sul. Além disso, *A. dayi* foi registrada pela primeira vez em florestas secas do Mato Grosso. Essas descobertas, juntamente aos resultados da árvore filogenética com elevada representatividade de espécimes, permitiram reconhecer a presença de espécies de três grupos-de-espécies no oeste Brasileiro: grupo *boliviensis* (*A. kadiweu*), grupo cursor (*A. diauarum*, *A. montensis*) e grupo *dolores* (*A. dayi*, *A. toba*), todos membros de um grande clado de *Akodon* que ocorre em terras baixas (exceto parte do grupo *boliviensis*), conforme recuperado pela presente hipótese filogenética. A revisão sistemática de *Thalpomys* permitiu melhor compreensão deste gênero pouco conhecido através de: i)_uma nova hipótese de relação de parentesco, recuperado como grupo irmão de *Necromys*, e não de *Podoxymys*, como estudos anteriores, ii)_a descoberta de uma potencial nova espécie para o Mato Grosso/Rondônia, iii)_redescrição de *T. cerradensis* e *T. lasiotis*, com inclusão de novos caracteres morfológicos diagnósticos, e alteração significativa das áreas de distribuição

geográfica, iv)_descrição da variação geográfica nos caracteres qualitativos e quantitativos, v)_a hipótese de que a diversificação de *Thalpomys* está intrinsecamente ligada ao Cerrado. As abordagens integrativas da sistemática de *Akodon* e *Thalpomys* revelaram que o oeste do Brasil abriga uma diversidade anteriormente subestimada de roedores da tribo Akodontini. Isto é relevante não apenas em relação à riqueza de espécies desta área, mas também por revelar um componente faunístico de espécies endêmicas do oeste do Brasil. Este estudo forneceu dados adicionais para a compreensão da diversificação/biogeografia da tribo Akodontini, e chama a atenção para a conservação do oeste brasileiro e de suas áreas de Cerrado e florestas secas de transição, ainda pouco estudadas e muito diversas.

Palavras-chave: América do Sul. *Akodon*. Delimitação de espécies. Filogenia. *Thalpomys*.

ABSTRACT

The tribe Akodontini comprise 16 genera and 91 species. Although widely distributed in South America, the tribe is absent in most of Chile and southern Patagonia, and few species occur in the Amazon. The phylogenetic relationships of this tribe, as well as the delimitation of new genera and species, have been revealed through systematic reviews and molecular studies. However, for several taxa, much of the geographic representation was not yet investigated. This is the case of *Akodon* and *Thalpomys*, phylogenetically close genera with distinct diversification patterns: 42 and two species, respectively. In Brazil, they occur mainly in the eastern and central regions, occupying areas of the Atlantic Forest and Cerrado. Records and the taxonomic status of members of these genera in western Brazil, in transition areas between the Amazon, Cerrado, and Pantanal, were rarely addressed in systematic studies. The present project aimed to: i) delimit and characterize the taxa within *Akodon* and *Thalpomys*, with special focus on specimens from western Brazil, ii) estimate the phylogenetic relationships among the species of each genus, and consequently illuminate part of the evolutionary history of the tribe Akodontini. The diversity of both genera was investigated under an integrative approach with karyological, morphological, morphometric, and molecular analyses. The study of these populations of *Akodon* allowed to recognize two new species, which we named as *A. diauarum*, endemic to Amazon/Cerrado transitional forests of Mato Grosso and Pará, and *A. kadiweu*, endemic to dry forests of Mato Grosso do Sul. Moreover, *A. dayi* was recorded in the dry forests of Mato Grosso, for the first time. These discoveries, along with the results of a densely sampled phylogenetic tree, allowed the recognition of three species-groups within western Brazil: *boliviensis* group (*A. kadiweu*), *cursor* group (*A. diauarum*, *A. montensis*), and *dolores* group (*A. dayi*, *A. toba*), all members of a large clade of *Akodon* that typically occur in lowlands (except for part of the *boliviensis* group) as recovered by the present phylogenetic hypothesis. The systematic review of *Thalpomys* allowed a better comprehension of this poorly known genus with: i)_a new hypothesis of a sister-relationship with *Necromys*, instead of *Podoxymys*, as previous studies suggested, ii)_the recovery of a putative new species from Mato Grosso/Rondônia, iii)_redescription of *T. cerradensis* and *T. lasiotis*, including new diagnostic characteres, with a significant change of their geographic range, iv)_geographic variation across qualitative and quantitative characters, v)_the hypothesis that the diversification of *Thalpomys* is intrinsically

linked to the Cerrado. The integrative approaches of the systematics of *Akodon* and *Thalpomys* herein revealed that western Brazil harbors a previously underestimated diversity of Akodontini rodents. This is relevant not only as related to species richness of this area, but also by revealing a faunal component of species endemic to western Brazil. The present study provided further data to the comprehension of the diversification and biogeography of the tribe Akodontini, and calls for attention to the conservation of western Brazil and its Cerrado and transitional dry forest areas, still poorly studied and very diverse.

Keywords: *Akodon*. Species delimitation. Phylogeny. *Thalpomys*. South America.

GENERAL INTRODUCTION

Members of the family Cricetidae are the dominant rodents in South America, with the Sigmodontinae comprising the most diverse of its subfamilies (Patton et al. 2015). The sigmodontines are small-sized mammals widely spread through different habitats of South America, ranging from tropical and subtropical forests to savannas and xeric formations; from sea level to plateaus in the Guiana and Brazilian Shields, and even higher altitudes at the Andes (D'Elía & Pardiñas 2015a). Thus, the evolutionary history of many Sigmodontinae tribes, genera and species is intrinsically linked to that of South American biomes and its geologic history (Patterson & Costa 2012; Parada et al. 2013). The rapid diversification of sigmodontines after their colonization of South America around 7.0-13.2 million years ago (Schenk et al. 2013) is likely one of the most rapid geographically discrete diversification event in mammalian history (Schenk & Stepan 2018). Current data about Sigmodontinae diversity indicates a few genera classified as *incertae sedis* (taxa with uncertain phylogenetic relationships) plus a 13 tribal-level lineages (Stepan & Schenk 2017; Pardiñas et al. 2022), encompassing 93 extant genera and 496 species (Patton et al. 2015; Pardiñas et al. 2017; MDD 2023).

1. *The tribe Akodontini Vorontsov, 1959*

The second most diverse group within Sigmodontinae is the tribe Akodontini, comprising about 16 living genera and 91 species (D'Elia & Pardiñas 2015b, MDD 2023). Since the first concepts of an akodontine group (Thomas 1916, 1918; Tate 1932), most taxa were classified in such a group according to its morphological resemblance with the genus *Akodon* (details in D'Elia & Pardiñas 2015b). Thus, most Akodontini taxa were firstly recognized either as a synonym or as a subgenera of *Akodon*, with few exceptions that had considered other valid genera (Gyldenstolpe 1932; Ellerman 1941; Cabrera 1961; Reig 1987; Hershkovitz 1990, 1998). Since the early 1990's, the composition of Sigmodontinae tribes, as well as its genera and species delimitation, have changed, mainly based on the results of molecular phylogenies (e.g. Smith & Patton 1993, 1999; D'Elía 2003). Based on *Cytb* sequences Smith & Patton (1999) accounted 13 Akodontini living genera: *Akodon*, *Bibimys*, *Blarinomys*, *Brucepattersonius*,

Juscelinomys, *Kunsia*, *Lenoxus*, *Necromys*, *Oxymycterus*, *Podoxymys*, *Scapteromys*, *Thalpomys* and *Thaptomys*. Later to these authors, other contributions were made by describing new genus (*Gyldenstolpia* - Pardiñas et al. 2009), new species (e.g. Quintela et al. 2014, 2017; Jayat et al. 2010, 2016), or improving the knowledge on phylogenetic relationships above species level (e.g. D'Elía 2003; D'Elía et al. 2003; Smith & Patton 2007; Jayat et al. 2010; Leite et al. 2015) - including new genera that fall within (*Castoria* and *Deltamys* - D'Elía 2003; Pardiñas et al. 2016a) or outside the Akodontini radiation (*Neomicroxus* - Alvarado-Serrano & D'Elía 2013). Thus, molecular-based phylogenetic studies have helped to elucidate Akodontini diversity and systematics in recent decades.

Regarding Sigmodontinae diversification, Reig (1986) proposed an Andean origin for this group, with its major tribes diversifying elsewhere. Recent data revealed that most Akodontini genera are entirely non-Andean, except for *Lenoxus* and few species of *Akodon*, *Necromys* and *Oxymycterus* (D'Elia & Pardiñas 2015b). Thus, the South American lowlands, such as Amazon, Atlantic Forest, Cerrado, Chaco, Patagonia, and southern grasslands, seem to have played an important role during the last ca. 8-6 Ma (Late Miocene) - a view early advanced by Smith & Patton (1999), but further discussed by modern biogeographic analyses proposing that most of the tribes diverged initially in eastern South America before multiple dispersals into the Andes (see Parada et al. 2013; Leite et al. 2014; Gonçalves et al. 2018). Maestri et al. (2018) also suggested that eastern South America were colonized by sigmodontines earlier than the central Andean region (and other southern regions). Indeed, these authors also include the Amazonian lowlands into this scenario and suggest a possible connection between the tropical Andes and the Atlantic Forest. As for Akodontini, they suggest a putative ancestor area close to the Central Andes, rather overlapping the one proposed for the Oryzomyini tribe (see Percequillo et al. 2021 for current hypothesis about Oryzomyini), and covering part of western Brazil.

Despite recent discussions, much remains to be investigated about biogeographic patterns and diversification of the tribe Akodontini. Currently the tribe ranges through a large portion of South America, but it is absent in most of Chile and southern Patagonia and present a particularly low diversity in Amazonia (D'Elia & Pardiñas 2015b). However, the lack of published records from western Amazonia and its transitional areas with Cerrado contrast with the increasing number of specimens in collections (see Silva et al. 2015).

Brazil presents a high diversity of rodents of the tribe Akodontini, with 14 genera and 41 species distributed along all of its biomes (see D'Elia & Pardiñas 2015b; Abreu-Júnior et al. 2023). However, taxa from the Atlantic Forest were comparatively more studied (e.g. Christoff et al. 2000; Geise et al. 2004, 2008; Nogueira & Fagundes 2008; Ventura et al. 2012; Pardiñas et al. 2016a, 2017b; Abreu et al. 2021) than the ones from other biomes (e.g. Andrade et al. 2004; Bezerra et al. 2007, 2020; D'Elia et al. 2008; Pardiñas et al. 2008). For example, in northwestern Brazil, an undescribed *Akodon* - treated as *Akodon* sp. 2n=10 (Pardiñas et al. 2015) - waited for a formal description during the last 24 years (Silva & Yonenaga 1998). This species is sister to *A. cursor*, an Atlantic Forest inhabitant, suggesting a closer relationship between the two most important forest formations in Brazil, the Atlantic and Amazonian forests (Silva et al. 2006). Yet, as already pointed on the importance of the Atlantic Forest highlands to the Akodontini biogeographic history (Gonçalves et al. 2007; Peçanha et al. 2020; Abreu et al. 2021), recent findings reveal a surprising biogeographic scenario as Leite et al. (2015), based on *Podoxymys* phylogenetic relationships, uncovered a connection between Brazilian and Guianan Shields during late Pliocene, highlighting the importance of high plateaus in the evolutionary history of the Akodontini. In spite of that, there are still scarce studies on open area dwellers that may reveal a more comprehensive biogeographic history of the Akodontini.

Some Akodontini genera are known to occur in western Brazil (D'Elia & Pardiñas 2015b; Brandão et al. 2019; Carmignotto et al. 2022), such as members of the Division *Akodon* (*Akodon*, *Necromys* and *Thalpomys*), the Division *Scapteromys* (*Gyldenstolpia* and *Kunsia*) and the Division *Oxymycterus* (*Oxymycterus*) (*sensu* D'Elia 2003). Brandão (2012) and Carmignotto et al. (2012) indicate a faunal similarity between the Bolivian and Paraguayan Chaco to the Cerrado, a proposition supported by increasing evidence of different small mammal species (e.g. Semedo et al. 2013; Gardner et al. 2014; Pardiñas et al. 2016b; Brandão et al. 2019; Bezerra et al. 2020; Fegies et al. 2021). Even so, the tribe Akodontini remains poorly investigated on this issue. In fact, the akodontine diversity and phylogenetic relationships remain almost completely unknown, as concerned to most of the taxa from western Brazil.

Within this scenario, are the genera *Akodon*, *Necromys* and *Thalpomys*, closely related lineages of the Division *Akodon* (*sensu* D'Elia 2003) of which specimens from western Brazil have accumulated in zoological collections (Carmignotto 2005; Brandão 2012; Brandão et al.

2019; Antunes et al. 2021; Carmignotto et al. 2022), but with only specimens of *Necromys* yet included in phylogenetic studies (Bezerra et al. 2020). The inclusion of this material in phylogenetic studies are thus needed to further investigate the diversity of Akodontini, as well the role of western Brazil within Akodontini radiation.

2. The genus *Akodon* Meyen, 1833

The genus *Akodon* is the most diverse of the tribe Akodontini, with a total of 42 species (Pardiñas et al. 2015; MDD 2023). Based on morphological and molecular evidence, there are five species groups of *Akodon* currently recognized and several species with no precise phylogenetic position, the *incertae sedis* ones (Smith & Patton 2007; Coyner et al. 2013; Pardiñas et al. 2015). A total of 11 species of *Akodon* are known to occur in Brazil (Abreu et al. 2022), which are members of different species groups (**Figure 1**).

Most *Akodon* species from Brazil refers to Atlantic Forest inhabitants and are lineages of the *cursor* group, except for *A. azarae* and *A. sanctipaulensis* – *incertae sedis* lineages (Pardiñas et al. 2015). There are also reports of other species from open or transitional areas on western Brazil, such as *Akodon* sp. 2n=10, now formally described as *A. diauarum* (Silva & Yonenaga 1998; Silva et al. 2006; Brandão et al., 2022), *A. toba* (Cáceres et al. 2011; Santos-Filho et al. 2012), and *A. varius* (Alho et al. 2011). While the former is another member of the *cursor* group (Silva et al. 2006), *A. toba* and *A. varius* are large sized species formerly gathered under the *varius* group *sensu* Myers (1989). Recently, mtDNA molecular-based analyses rearranged the *varius* group *sensu* Myers (1989) into a Yungas clade (which includes *A. varius*) and a lowland clade (which includes *A. toba*) (Braun et al. 2008). Jayat et al. (2010), with a broader taxonomic coverage, referred to the lowland clade as the *dolores* group, while Coyner et al. (2013), based on three additional molecular markers, suggest the inclusion of the *varius* group *sensu stricto* (i.e. Yungas clade) within the *aerosus* group – a decision not followed by Pardiñas et al. (2015).

Considering the complex taxonomic history of these groups and the fact that *Akodon* from western Brazil were reported without any morphological, genetic or karyological information, specimens from western Cerrado, Pantanal and Amazon transitional areas need to be carefully

studied. Indeed, these taxa may represent an important part of the diversification of this genus in Brazil, especially considering that up to now only the *cursor* group – occurring in eastern Brazil – were focus of previous studies.

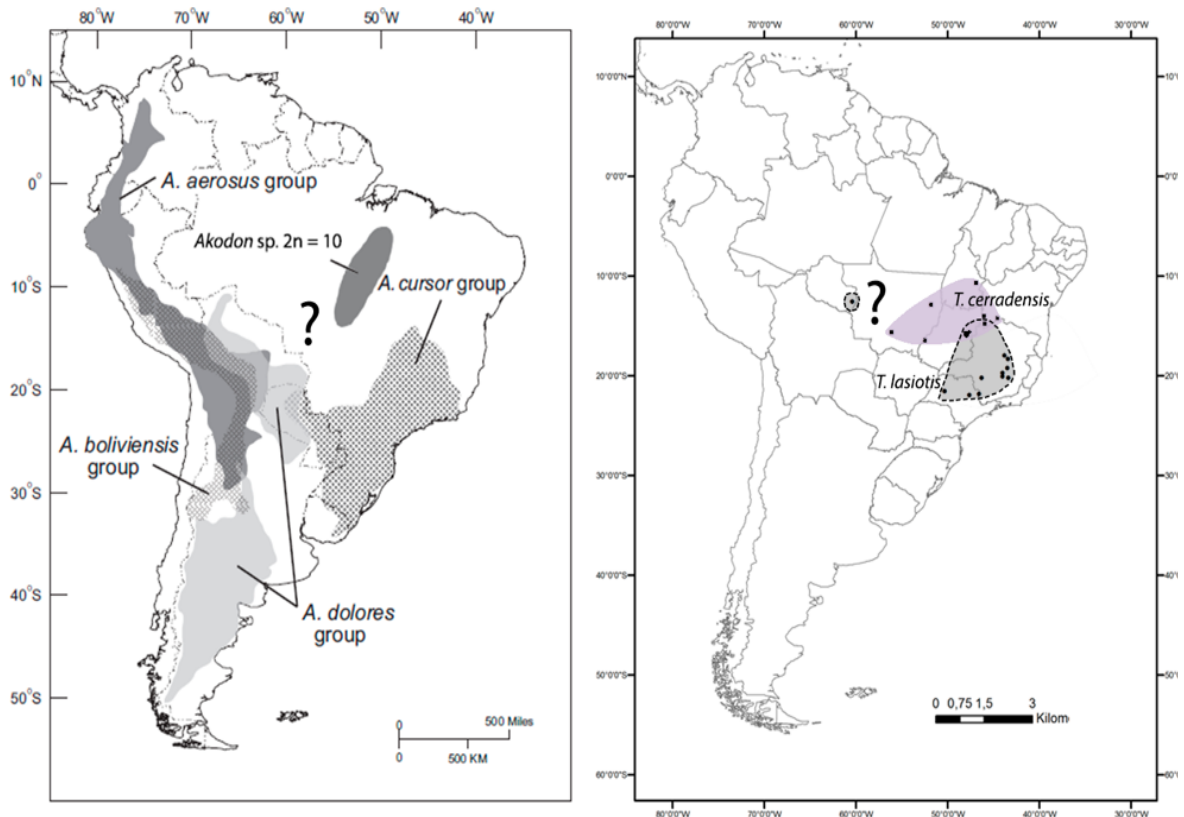


Figure 1. Distribution of the four species groups of the genus *Akodon* (on the left; adapted from Coyner et al. [2013], with the inclusion of *Akodon* sp. 2n=10, see Pardiñas et al. [2015]) and of the two species of *Thalpomys* (on the right: adapted from Pardiñas & Teta [2015]). The westernmost record of *T. lasiottis* (gray area in Rondônia state, Brazil) was intentionally isolated, since there is a gap of $\pm 1,300$ km to the nearest locality (Brasília, Brazil); moreover, it represents a record from an unpublished thesis (Nunes, 2001). The question mark refers to a gap of published records of both genera.

3. The genus *Thalpomys* Thomas, 1916

The genus *Thalpomys* is currently composed of two species endemic to the Brazilian Cerrado. This genus is among the most poorly known genera of Akodontini, with only few

studies dedicated to investigating its morphological and genetic variation (Hershkovitz 1990; Andrades et al. 2004). Because of its endemism to Cerrado biome and close phylogenetic relationship to the genus *Podoxymys* (Leite et al. 2015), an endemic lineage to the Pantepui region (Guianan Shield), the genus *Thalpomys* may represent an important piece in the evolutionary puzzle of Akodontini from the open formations of South America. Thus, the affinity between these sister-genera deserves further investigation, which might depend also on a comprehensive knowledge on *Thalpomys* species diversity and variation (genetic and morphologic), all poorly investigated issues. Indeed, this sister-genera relationship is only moderately supported (Leite et al. 2015), and consistent morphological comparisons between *Thalpomys* and *Podoxymys* are yet to be done.

Considering the wide geographic range of *Thalpomys* (**Figure 1**) and the small number of localities and specimens studied until now (see Hershkovitz 1990; Andrades et al. 2004), one might expect to uncover a higher richness for the genus, or at least geographically structured populations (see Carmignotto 2005; D'Elia & Pardiñas 2015). Since both species are currently under threat – Vulnerable category (VU) for *T. cerradensis* and Endangered (EN) for *T. lasiotis* (MMA 2022), the new data might also change the scenario for their conservation.

4. Samples from western Brazil.

Carmignotto (2005) proposed that the western portion of the Cerrado harbors a unique small mammal assemblage, a result further supported by recent molecular evidences for marsupials (Semedo et al. 2015; Ferreira et al. 2020; Fegies et al. 2021) and rodents (Suárez-Villota et al. 2018; Semedo et al. 2020; Saldanha & Rossi 2021), which could be the case for *Akodon* and *Thalpomys* (see Brandão 2012). Besides the composition distinctiveness, this region also harbors high mammal diversity - Mato Grosso do Sul, 166 sp. (Tomas et al. 2017) and Mato Grosso, 267 sp. (Brandão et al. 2019) - appearing as a priority area to conserve and study.

New records and specimens of volant and non-volant small mammals (e.g. Semedo et al. 2013, 2022; Brandão et al. 2015, 2016, 2019, 2020; Barbosa et al. 2016) have been accumulating in recent decades, including specimens of *Akodon* and *Thalpomys* (Santos-Filho

et al. 2008; Brandão et al. 2019; Carmignotto et al. 2022). These published recent records, along with ancient records (Pine et al. 1970; Myers 1989; Hershkovitz 1990) and newly collected specimens (unpublished data) housed at the MZUSP collection (**Figure 2**), add up to 37 localities and prompted the present doctorate thesis to investigate the diversity within samples of western Brazil.

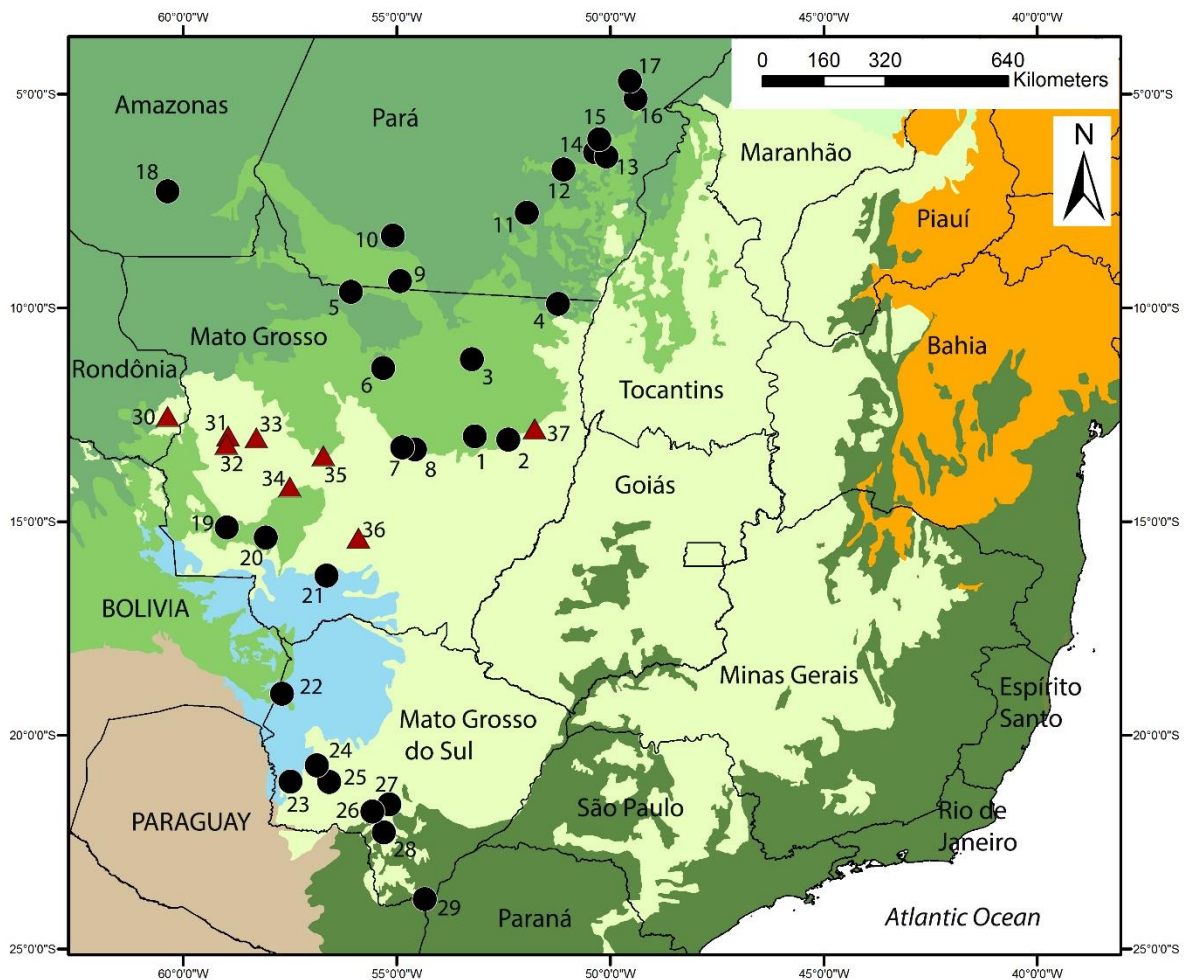


Figure 2. Records of *Akodon* (black circles) and *Thalpomys* (red triangles) from western Brazil. All records are based on specimens examined in the present study [except locality 37 (Hershkovitz 1990) and 26 (Hannibal & Godoy 2015)].

5. Thesis objectives and structure

The present project aimed: 1- to delimit and characterize the taxa within the genera *Akodon* and *Thalpomys*, with special focus on specimens inhabiting western Brazil, and 2- to

uncover the phylogenetic relationships among species of each genus, in order to provide additional evidence of the evolutionary history of the Akodontini in Brazil and South America. The diversity of both genera was investigated under an integrative approach that included karyological, morphological, morphometric, and molecular analyses of specimens. The objectives of this project were achieved:

- i. investigating karyological, morphological, morphometric and genetic variation of specimens leading to the diagnose of the valid species through qualitative and quantitative approaches describing intra and interspecific variation both on morphological and molecular grounds;
- ii. recovering the phylogenetic relationships among the specimens studied, aiding in the delimitation of species and its populations;
- iii. determining the nomenclatural history through the elaboration of synonymies and assign the appropriate scientific names to the recognized species;
- iv. delimiting the geographical distribution and relating phylogenetic data to geography, establishing biogeographic hypotheses.

The thesis is divided in two volumes. The volume I includes the general introduction, of the thesis, followed by studies dedicated to the genus *Akodon*, which refer to the taxonomic history of the genus (Chapter 1), three published articles dealing with the description of new species based on extant and/or subfossil specimens (Chapters 2, 3 and 4), and a new phylogenetic hypothesis for the genus and species delimitation (Chapter 5). The volume II includes the systematic review of the genus *Thalpomys* (Chapter 6) and a general discussion and conclusion of the thesis.

GENERAL DISCUSSION

Previous studies have shown that integration of morphometric, morphologic, karyotype and molecular data, interpreted in a geographic context, is a proper approach to assess species boundaries of taxonomically difficult groups, as is the case of sigmodontine rodents (e.g. Suárez-Villota et al. 2018; Abreu et al. 2021; Prado et al. 2021; Di-Nizo et al. 2022). In this context, the use of an integrative approach herein allowed to infer previously unknown species diversity within *Akodon* and *Thalpomys*. With these findings, the present study clarifies the phylogenetic relationships within both genera, and contributes to a better understanding of the biogeographic history of western Brazil.

Besides confirming previous records and providing new ones for *A. montensis* and *A. toba* in the westernmost borders of the Brazilian Cerrado and Pantanal (Myers 1990; Valdez & D'Elia 2013; present study), our analysis of *Akodon* populations in western Brazil allowed the description of two new species (*A. kadiweu* and *A. diauarum*). We also report a subfossil record of *A. kadiweu*, and the first record of a species previously known only for Bolivia (*A. dayi*), which refers to a species complex (Braun et al. 2008; present study). The new species described here are endemic to transitional dry forests of western Brazil, as it is also likely to be the case for the Brazilian population of *A. dayi*, which may prove to be an undescribed species. Thus, the general finding of our study is the relevance of dry forests of western Brazil to at least three species-groups of *Akodon*: *boliviensis* group (*A. kadiweu*), *cursor* group (*A. diauarum* and *A. montensis*), and *dolores* group (*A. dayi* and *A. toba*). These discoveries highlight the importance to develop future studies that investigate species richness, endemism levels, and biogeographic history of this so called transitional dry forests, that are located between representative South American biomes, such as the Amazon, Cerrado, Chaco and Pantanal.

The systematic revision of *Thalpomys* highlights the importance of the Cerrado in the diversification of sigmodontine rodents. This study indicates that, although *Thalpomys* is widespread within the Cerrado, both species of this genus are strictly restricted to this domain, being absent even from transitional areas adjacent to open biomes, such as the Caatinga and Pantanal. Thus, together with *Juscelinomys* and *Microakodontomys*, *Thalpomys* is a sigmodontinae lineage linked to the biogeographic history of the Cerrado domain

(Carmignotto et al. 2012; Gutiérrez & Marinho-Filho 2017; present study). The likelihood of a future recognition of the population of western Cerrado as a new species of *Thalpomys*, would add another piece of the puzzle of our still incomplete knowledge of the biogeographic history of this domain.

The importance and diversity of areas within western Brazil have long been indicated by previous studies (Cáceres et al. 2008; Tomas et al. 2017; Brandão et al. 2019; Antunes et al 2021a, b). Western Brazil shelters two (Cerrado and Mato Grosso Dry Forests) of the 13 ecoregions with highest conservation priority for mammals in Brazil, along with the Chiquitano Dry Forest that is considered as medium priority (Alves & Brito 2013; Carmignotto & Astúa, 2023). The presence of endemic taxa is one of the criteria for such classifications. The results of the present study add another endemic taxa to these regions, and indicate the need to keep developing scientific expeditions to poorly known and threatened regions.

CONCLUDING REMARKS

The present study was able to delimit and characterize the taxa within the genera *Akodon* and *Thalpomys*, uncovering the phylogenetic relationships among species of each genus. In this context, this study provides additional evidence for the comprehension of the evolutionary history of the tribe Akodontini in Brazil and South America. As the main goals of the present study are achieved, it has led to the discovery of significant findings pertaining to the biogeography of the Sigmodontinae rodents, especially within the Cerrado and Dry Forests of western Brazil. It is also evident that this region merits further investigation.

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