



ON THE DISTINCTION AND AVAILABILITY OF THE NEW TAXA PROPOSED BY AGNOLIN ET AL. 2019

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ABSTRACT. Recently, Agnolin et al. (2019) described 14 new species of mammals, including 12 rodents, one bat, and one carnivore, and one new subspecies of rodent. In addition, these authors proposed several other nomenclatorial acts: some nominal forms were removed from synonymies and hypothesized as distinct species, at the time that three new genera, one subtribe, and one tribe of mammals were also named. We reviewed the merits of all nomenclatorial acts proposed by Agnolin et al. (2019) and concluded that all 14 new species and the new subspecies, as well as those forms removed from synonymies, should be treated as synonyms of already known species. We suggest the same regarding the three new supraspecific taxa presented by Agnolin et al., two of which are not available as they fail to comply with the provisions of the International Code of Zoological Nomenclature. We end this contribution criticizing the way that mammal taxonomy was approached by Agnolin et al. (2019).

RESUMEN. Sobre la distinción y disponibilidad de los nuevos taxones propuestos por Agnolin et al. 2019. Recientemente, Agnolin et al. (2019) describieron 14 especies nuevas de mamíferos, incluyendo 12 roedores, un murciélago y un carnívoro, y una nueva subespecie de roedor. Además, estos autores propusieron varios otros actos nomenclatoriales: algunas formas nominales se eliminaron de las sinonimias y se hipotizaron como especies distintas; se nombraron tres nuevos géneros, una subtribu y una tribu de

mamíferos. Revisamos todos los actos nomenclatoriales propuestos por Agnolin et al. (2019) y concluimos que las 14 nuevas especies y la nueva subespecie, así como las formas eliminadas de las sinonimias, deben tratarse como sinónimos de especies ya conocidas. Sugerimos lo mismo con respecto a los tres nuevos taxones supraespecíficos presentados por Agnolin et al. (2019), de los cuales dos no están disponibles ya que no cumplen con las disposiciones del Código Internacional de Nomenclatura Zoológica. Terminamos esta contribución criticando la forma en que Agnolin et al. (2019) realizaron su abordaje taxonómico.

Key words: Carnivora, Chiroptera, Mammalia, Rodentia, taxonomy.

Palabras clave: Carnivora, Chiroptera, Mammalia, Rodentia, taxonomía.

INTRODUCTION

The fact that we are living an age of extant species discovery is well known to everyone familiar with biodiversity. This is also true for well-studied groups such as mammals, whose known species diversity has increased by 20% over the last 13 years (Burgin et al. 2018). In particular, new small mammal species are constantly being described from both newly collected specimens and from the study of specimens already housed in biological collections (e.g., Moratelli & Wilson 2011; Jiménez & Pacheco 2016). For instance, at least 248 new rodent species, of which 104 are from South America, were described from January 2000 to the end of 2017 (D'Elía et al. 2019, see also Teta & D'Elía 2019). Similarly, mammal classification keeps changing, mostly due to results of new phylogenetic studies. These changes pertain to all taxonomic categories above the species level, being more frequent at the genus level. For instance, at least 32 new rodent living genera were proposed in the period of January 2000-December 2017, several of which involve South American forms (e.g., Percequillo et al. 2011; Alvarado-Serrano & D'Elía 2013; Teta et al. 2017). As such, the proposition of new mammal species and genera, in particular rodents, is not surprising and is expected to continue for several years (D'Elía et al. 2019).

Recently, Agnolin et al. (2019, hereafter Agnolin et al.), described 14 (and not 15 as stated in their abstract) new extant species of mammals (12 rodents, one bat, and one carnivore) and one rodent sub-species, being all endemic to Argentina. Along with the recognition of the new species and subspecies, Agnolin et al. proposed several other nomenclatorial acts. Some available species level taxa were removed from synonymies and hypothesized as distinct species, at the time that three new genera, one subtribe, and one tribe were also named. Taken as a whole, the study of Agnolin et al. is remarkable for the large number of new species level taxa proposed -spanning three mammalian orders- in addition to

the proposition of changes in the classification above the species level.

A noteworthy aspect of the study of Agnolin et al. is that some new species belong to relatively well studied genera of Sigmodontinae (e.g., *Akodon*, *Calomys*, *Oligoryzomys*, *Oxymycterus*), which have been recently taxonomically tackled through analysis of molecular and/or morphological evidence (e.g., Gonçalves & Oliveira 2004; Jayat et al. 2010; Martínez et al. 2016; Hurtado & D'Elía 2019a). This is not to say that new species cannot be found in these groups (see examples of recent species described in these genera by Jiménez et al. 2013; Hurtado & D'Elía 2018; Peçanha et al. 2019), but it is remarkable that Agnolin et al. did not take advantage of the available literature focused on these groups, ignoring data and results (e.g., the degree and pattern of genetic and morphological variation revealed by Gonçalves & Oliveira [2004] for populations of *Oxymycterus* from northeastern and central Argentina).

Similar problems are found regarding the new supraspecific taxa proposed by Agnolin et al. In addition to failures to accomplish some requirements of the International Code of Zoological Nomenclature (ICZN 1999; 2012), that make unavailable two of the five proposed supraspecific taxa, their propositions were made almost out of phylogenetic context, which is contrary to systematic practices well established decades ago. In general, the relatively vast literature on sigmodontine phylogenetics was disregarded (e.g., evidence against the putative monophyly of the *Akodon varius* group, as referred in Agnolin et al., see discussion below) and in most cases directly ignored (e.g., the assemblage referred to Holochilini is not a monophyletic group, see discussion below).

Given these antecedents, we here attempt to highlight some of the most prominent problems in the study of Agnolin et al. We conclude that the 14 new species and the new subspecies should be treated as synonyms of already known species. The same

nomenclatural procedure is suggested regarding the three new supraspecific names presented by Agnolin et al. that are nomenclatorially available. These taxonomic and nomenclatorial issues are presented in detail and summarized in **Table 1**.

MATERIAL AND METHODS

We reviewed the holotypes (and part of the type series), housed at the Fundación de Historia Natural Félix de Azara (CFA-MA; Buenos Aires, Argentina, see Appendix 1), diagnoses, and descriptions of the new taxa defined by Agnolin et al., comparing them with published evidence as well as our own direct assessment of relevant specimens. The collections and specimens examined to elaborate this review are listed in the Appendix 1 and in our earlier publications: Oliveira et al. (1998), Gonçalves & Oliveira (2004), Teta et al. (2007; 2013), D'Elia et al. (2008), Jayat et al. (2008a;b; 2010; 2018), Moratelli et al. (2011a; 2013; 2016; 2017; 2019), Libardi (2013), Schiaffini et al. (2013), Chiquito et al. (2014), De Tommaso et al. (2014), Libardi & Percequillo (2016), Schiaffini (2016), Schiaffini & Prevosti (2019), and Hurtado & D'Elia (2019a;b). Comparative tables of external and cranial measurements among samples and taxa are included as a Supplementary file (**Tables S1-S11**). In our review, we discarded the morphological characters that are variable among conspecific individuals at the intra- and interpopulational levels. Then, we contextualized each of the supposedly new species under previous knowledge.

RESULTS AND DISCUSSION

Taxonomy is discussed below in a hierarchical arrangement, beginning with orders, families, tribes and then following with genera, species and sub-species.

Order Carnivora Bowdich 1821

Family Mephitidae Bonaparte 1845

After mistakenly stating that Linnaeus (and not Bowdich) is the author of Carnivora, Agnolin et al. described a new species of the genus *Conepatus* Gray 1837, *C. carloschebezi*, and recognized as distinct species other four nominal forms: *C. chinga* (Molina 1782), *C. humboldtii* (Gray 1837), *C. rex* Thomas 1898, and *C. feuillei* Eydoux & Souleyet 1841. Remarkably, Agnolin et al. did not contextualize their study with that of Schiaffini et al. (2013), that based on pelage pattern variation, geometric morphometrics of the skull and mandible, and phylogenetic analysis of DNA sequences, considered all populations from Argentina, Chile, and Uruguay as part of the same species, *C. chinga*. Agnolin et al. did not quantify the pattern of pelage variation neither provide detail on it to sustain their taxonomic scenario. Pelage coloration has been proved to be highly variable both within and among populations of the genus

Conepatus (see Van Gelder 1968; Schiaffini et al. 2013). A detailed analysis of pelage coloration of *Conepatus* showed that the white marks of the head, the length of the white bands, and the presence of bicolored hairs are not useful state characters to diagnose species of *Conepatus* (Schiaffini et al. 2013).

Agnolin et al. diagnosed the new species *C. carloschebezi* (designating as holotype an adult female specimen [MACN-Ma 47.119]), mainly on its small size, pelage coloration, undeveloped crests, and narrow M1. However, size of *C. chinga* has shown to be highly variable regarding environmental conditions, with specimens from more productive biomes attaining larger sizes, and those from arid regions being smaller (Schiaffini 2016). Crest development is a clear indication of sexual dimorphism, in which male specimens display well marked crests and females lack this condition, presenting a much more rounded skull (M. Schiaffini, pers. obs., see also Van Gelder 1968). Another trait used to describe *C. carloschebezi* is "...M1 notablemente estrecho" (Agnolin et al. 2019); no indication on how this trait was assessed was provided. In fact, our measurements of the wide (measurement taken between the most external lingual and labial points) and the mesial-anterior length (measurement taken at the labial side) of the M1 of the holotype of *C. carloschebezi* (MACN-Ma 47.119) are, respectively, 7.85 and 5.77 mm, which fall within the range of *C. chinga* (see Schiaffini & Prevosti, 2019 and **Tables S1**). Other specimens of *C. chinga* with very similar measurements were collected at Chubut, La Pampa, and Salta provinces, Argentina (MACN-Ma 28.74, 15574 and 36.332 [see Schiaffini et al. 2013; Schiaffini 2016], respectively). Agnolin et al. did also not provide skull measurements, precluding any comparison.

Regarding the recognition of *C. humboldtii* as a different species, most of the supposedly diagnostic traits between this nominal form and *C. chinga* (e.g., size and shape of the lingual cingulum in the M1 and the protocone shelf [not a "talonid"] in P4; size and shape of the anterior opening to the nasal cavity), are variable among individuals from different populations (Schiaffini et al. 2013). Even more, the specimens analyzed in Agnolin et al. had already been included in the morphological analyses conducted by Schiaffini et al. (2013), being all considered as part of *C. chinga*. Based on the facts previously discussed, we kept the names *C. carloschebezi*, *C. humboldtii*, *C. rex*, and *C. feuillei* under the synonymy of *C. chinga* (**Table 1**; see also Kipp 1965).

Order Chiroptera Blumenbach 1779

Family Vespertilionidae Gray 1821

Agnolin et al. described a new species of the genus *Myotis* Kaup 1829, *M. yoli*, from southern Argentina. However, their characterization of this new taxon is far from accurate, the opposite of what would be expected for a complex and morphologically homogenous genus such as *Myotis* (e.g., Moratelli et al. 2011a; 2013; 2016; 2017; 2019). According to Agnolin et al., *M. yoli* is morphologically closer to *M. chiloensis* (Waterhouse 1840), *M. dinellii* Thomas 1902, and *M. levis* (I. Geoffroy 1824), meanwhile it occurs in sympatry with *M. chiloensis*. Regrettably, Agnolin et al. did not provide measurements for the type series of *M. yoli*, nor for the specimens of the species used in comparisons, which prevents us from making quantitative comparisons. However, based on the analyses of primary types -including those of *M. chiloensis* (FMNH 240296), *M. dinellii* (BM 0.7.9.4), *M. levis* (MNHN 1997.1805), and *M. yoli*- and comprehensive series of all South American species of *Myotis* (see the lists of specimens examined in Moratelli et al. 2011b; Moratelli & Wilson 2011; 2014; Moratelli et al. 2011a;b; 2013; 2016; 2017; 2019), we can confidently advance that *M. yoli* can be distinguished from *M. dinellii* and *M. levis* by the fur length and texture (longer and wooly in *dinellii* and *levis*), absence of a fringe of hairs along the trailing edge of the uropatagium (usually present in *dinellii* and *levis*), ear length (larger in *dinellii* and *levis*), and fur color (reddish to yellowish-brown in *dinellii*), but not from *M. chiloensis*. In fact, most of the diagnostic traits provided for *M. yoli* fall within the range variation of *M. chiloensis* (Barquez et al. 1999; Novaes et al. 2018). Similarly, we measured the holotype and some paratypes of *M. yoli* and their values fall within the range of *M. chiloensis* (see Table S2). Even when Agnolin et al. stated that “En *M. yoli* [sp.] nov., a diferencia de *M. chiloensis*, y a semejanza de *M. levis*, los pelos del dorso son unicolores (bicolores en *M. chiloensis*, con la base pardo oscura y las puntas castañas; punta amarillenta en *M. dinelli* [note: the correct spelling is *dinellii*] Barquez et al. 1999),” our direct inspection of the holotype of *M. yoli* (CFA-MA-5237) allowed us to confirm that this trait was wrongly scored. In fact, the dorsal hairs of the holotype are gray at their base and brownish at their end, as in *M. chiloensis* (see Novaes et al. 2018; Figure 3) and most of the South American species of *Myotis* (see Moratelli & Oliveira 2011; Moratelli & Wilson 2011; 2014; Moratelli et al. 2011a;b; 2013; 2016; 2017; 2019). Additionally, in all South American species

of *Myotis* the ventral fur is lighter than the dorsal fur, with strongly bicolored hairs (see Moratelli & Oliveira 2011; Moratelli & Wilson 2011; Moratelli et al. 2011a;b; 2013; 2016; 2017; 2019). Agnolin et al. also reported that “en *M. yoli* [sp.] nov. los pterigoides posteriormente convergen hacia el centro, mientras que en las otras especies estos elementos son subparalelos entre si y e [sic] incluso levemente divergentes posteriormente.” However, this trait is highly variable in most species of South American *Myotis* and cannot be used as diagnostic based on the analysis of only four specimens (Moratelli et al. 2013). With this evidence at hand, we regard *M. yoli* as a junior synonym of *M. chiloensis*. The same conclusion was recently reached by Barquez et al. (2020), in the new edition of their guide of Argentinean bats.

Order Rodentia Bowdich 1821

Family Cricetidae Fischer 1817

Tribe Akodontini Cockerell & Printz 1914

Subtribes Akodontina and “Oxymycterina”: Agnolin et al. opened the section on the tribe Akodontini stating “...es sin lugar a dudas la más compleja y especiosa dentro de los Sigmodontinae”, which is an incorrect premise as Oryzomyini is the most speciose tribe of the subfamily (cf. Patton et al. 2015). In addition, Agnolin et al. ignored or misunderstood the available phylogenetic hypotheses for the tribe (see D'Elía 2003). They indicated that “Dentro de los Akodontini se diferencian dos sendos clados, representados por los linajes *Akodon* y *Oxymycterus*, respectivamente,” a statement that is at least misleading, if not definitely wrong. The tribe Akodontini is composed of five main clades (regarded as divisions by D'Elía 2003), whose typical genera are *Akodon* Meyen 1833, *Blarinomys* Thomas 1896, *Bibimys* Massoia 1979, *Oxymycterus* Waterhouse 1837 and *Scapteromys* Waterhouse 1837. Relationships among these groups vary among works (e.g., the *Akodon*, *Bibimys*, and *Oxymycterus* divisions form a clade in D'Elía 2003; *Akodon* and *Oxymycterus* divisions are sister to each other in Salazar-Bravo et al. 2016), but no study proposed a basal dichotomy of the akodontine clade leading in one hand to *Akodon* (and related genera) and in the other to *Oxymycterus* (and related genera). Agnolin et al. limited their new subtribe Akodontina to the *Akodon* division of D'Elía (2003; see also Leite et al. 2015 for the inclusion of *Podoxymys* Anthony 1929 in this clade) that is a monophyletic group. Meanwhile,

“Oxymycterina” as delimited to include *Oxymycterus* and *Brucepattersonius* Hershkovitz 1998, and likely *Lenoxus* Thomas 1909, is not monophyletic. The *Oxymycterus* division includes *Oxymycterus* and *Juscelinomys* Moojen 1965, while *Brucepattersonius* and *Lenoxus* are part of the *Blarinomys* division (D’Elía 2003; a similar arrangement is recovered by Stepan & Schenk 2017). In addition to this, under the subtribal classification of Agnolin et al., several akodontine genera (e.g., *Bibimys*, *Scapteromys*, *Kunsia* Hershkovitz 1966) are not placed in any subtribe.

We note, furthermore, that the subtribe Akodontina is not a new family name, as Agnolin et al. indicate in his nomenclatorial act (i.e., urn:lsid:zoobank.org:act:B32BB459-4C71-4933-A1AE-F261A1A24471). As the ICZN indicates (Art. 36.1) “A name established for a taxon at any rank in the family group is deemed to have been simultaneously established for nominal taxa at all other ranks in the family group; all these taxa have the same type genus, and their names are formed from the stem of the name of the type genus [Art. 29.3] with appropriate change of suffix [Art. 34.1]. The name has the same authorship and date at every rank”. Therefore, if Akodontina is going to be recognized it will be referred to Cockerell & Printz 1914 (see Cazzaniga et al. 2019). However, we provisionally maintain Akodontini without subtribes.

The subtribe “Oxymycterina” was credited by Agnolin et al. (p. 146) to Vorontsov 1959. This is a mistake, as Vorontsov (1959) did not intend to create a family group taxon with *Oxymycterus* as its type genus. The notion of an oxymycterine group can be traced back to Hershkovitz (1962) and the first usage of Oxymycterini is in Massoia (1981), which was based on the notion of Hershkovitz (1962). However, the name would be unavailable because Hershkovitz (1962) did not include a diagnosis or a description of the oxymycterines (see discussion in Cazzaniga et al. 2019). Even when Agnolin et al. provide a type genus and a diagnosis for “Oxymycterina”, the name is still unavailable because these authors failed to propose it explicitly as a new taxon (cf. Art. 16; ICZN 1999).

Agnolin et al. also misunderstood distinct aspects of the rich and complex taxonomic history of Akodontini. For instance, when listing the contents of the new subtribe Akodontina, Agnolin et al. stated that “Retenemos a *Deltamys* dentro de Akodontini, de acuerdo a la visión tradicional sumariada por Reig (1987; Massoia, 1980; Bianchini y Delupi, 1994;

González y Massoia, 1995). Sin embargo, análisis moleculares (D’Elía et al. 2003) sustentan la exclusión de este género.” This is also incorrect. D’Elía (2003) did not exclude *Deltamys* Thomas 1917 from Akodontini; they showed that it represents a distinct generic lineage from that represented by *Akodon*, and as such proposed to consider *Deltamys* as a genus distinct of *Akodon*, but regarded it, of course, as an akodontine. Moreover, to the best of our knowledge, no author has ever suggested that *Deltamys* is not an akodontine (e.g., D’Elía et al. 2007; D’Elía & Pardiñas 2015).

Akodon and associated genera: Another notable misunderstanding of the akodontine taxonomic literature by Agnolin et al. is to have equated in contents the *Akodon boliviensis* size class of Hershkovitz (1990) with the *Akodon boliviensis* species group (see Jayat et al. 2010). The former is an informal phenetic assemblage of small sized species, while the second is a clade defined in a phylogenetic context; despite the similarity on names, both vary much in definition and content. Then it is incomprehensible how Agnolin et al. restricted *Akodon* to “a aquellas especies incluídas en el “grupo boliviensis” (“*Akodon boliviensis* size class” de Hershkovitz, 1990 y “*Akodon boliviensis* species group” de Myers et al., 1990, Smith y Patton, 2007, Jayat et al., 2010)”; it only could be restricted to one assemblage of those two. In fact, among the small sized species included by Hershkovitz (1990) in his *Akodon boliviensis* size class are *A. azarae* Fischer 1829 and *A. iniscatus* Thomas 1919, which Agnolin et al. placed in their new genus “*Miniakodon*” (the inclusion of the form *iniscatus* was indicated as tentative).

In addition to restricting *Akodon* to the *boliviensis* species group (see comments above), Agnolin et al. removed *Hypsimys* Thomas 1918 from the synonymy of *Akodon*, regarding it as a distinct genus, and named three new genera, *Albakodon*, “*Miniakodon*,” and *Macroakodon*. One of the main problems with this classification, whose discussion was completely omitted by Agnolin et al., is the fact that under the scheme of five genera (*Akodon*, *Albakodon*, *Hypsimys*, “*Miniakodon*,” and *Macroakodon*), with the species contents proposed by them (see below), several species currently attributed to *Akodon* (e.g., the entire contents of the *A. cursor* and *A. aerosus* species groups, encompassing at least 15 species) lack generic assignment. This situation is due to the fact that Agnolin et al. disregarded the extensive phylogenetic literature on relationships among species of *Akodon* (e.g., Smith & Patton 2007; Jayat et al. 2010; Coyner et al. 2013). As such, we suggest

not to use the generic arrangement proposed by Agnolin et al. until a comprehensive review of *Akodon* is undertaken. In addition, as explained below, the genera proposed by Agnolin et al. have other problems.

Agnolin et al. described *Albakodon* to contain “*A. albiventer* Thomas, 1897 y *A. berlepschii* Thomas, 1898.” Currently, both forms are considered as synonyms (e.g., Pine et al. 1979); no evidence to validate *berlepschii* was provided by Agnolin et al. In addition, Agnolin et al. erected “*Miniakodon*” to contain “*M. azarae azarae* (Fischer, 1829), *M. a. pautassoi* nov., *M. bibianae* (Massoia, 1983), *M. chebezi* nov., *M. rumbolli* nov. y posiblemente *A. phillipmyersi* Pardiñas et al., 2005 y *A. iniscatus* Thomas, 1919.” In addition to the fact that these species do not form a monophyletic group (e.g., Gonçalves et al. 2007; Jayat et al. 2010), this generic name is not available since no type species was designated, representing a *nomen nudum*. The description of the two new species and one subspecies within “*Miniakodon*”, “*M. chebezi*”, “*M. rumbolli*”, and “*M. azarae pautassoi*” are also problematic. Both proposed new Pampean species are morphologically undistinguishable from other Pampean samples of *Akodon azarae*. In fact, most of the supposedly diagnostic traits of *chebezi* and *rumbolli* can be documented within a given population (e.g., external coloration) and/or are ontogenetically variable (e.g., the sharpness of the supraorbital borders). Our hypothesis is also sustained by morphometric evidence, including the study of large samples from central La Pampa province and southeastern Buenos Aires province (see Table S3). In the same line, “*Miniakodon azarae pautassoi*”, a proposed new subspecies, is morphologically undistinguishable from other Chacoan samples of *Akodon azarae bibianae* (cf. Massoia 1971), a valid subspecies also supported by phylogenetic analysis of DNA sequences (Coyner et al. 2013). Regarding the recognition of “*Miniakodon bibianae*” as a different species, Agnolin et al. did not provide molecular or morphometric evidence to support such statement, nor acknowledged the debated taxonomic status of this form (see Coyner et al. 2013). As in other cases, their validation is based on subtle differences in external coloration or cranial characters that are either age-related or variable within populations (see Myers 1989; Myers & Patton 1989a;b).

Agnolin et al. proposed the genus *Macroakodon* (type species, *Akodon dolores* Thomas 1916) to contain the species “*A. glaucinus* Thomas, 1913, *A. simulator* Thomas, 1916, *A. tartareus* Thomas,

1919, *A. varius* Thomas, 1902, *A. dayi* Osgood, 1916, *A. toba* Thomas, 1921, *A. neocenus* Thomas, 1919, *A. dolores* Thomas, 1916, *M. naranja* nov., *M. calei* nov. y *M. calilegua* nov.” As was defined by Agnolin et al., this genus contains some taxa from two well supported clades of *Akodon* that are not sister to each other; i.e., the *dolores* and *varius* species groups (Jayat et al. 2010; Coyner et al. 2013). Agnolin et al. (page 138) explicitly disregard the available phylogenetic evidence and choose to delimit a non-monophyletic species assemblage as a genus. In addition, once again against available phylogenetic evidence, Agnolin et al. placed *Akodon iniscatus*, a member of the *A. dolores* species group (see Jayat et al. 2010), in “*Miniakodon*”. Both proposed new species, *Macroakodon naranja* and *M. calei*, are morphologically undistinguishable from *A. dolores* as currently understood (i.e., including *A. molinae* and *A. neocenus* in its synonymy). All the supposedly diagnostic traits that characterized each of the new species are individually or ontogenetically variable (cf. Myers 1989). Our examination of large samples of individuals from La Pampa and Córdoba, including the holotypes of *Macroakodon naranja* and *M. calei*, supports this hypothesis (see also Table S4), which is also sustained by karyological evidence (cf. Bianchi et al. 1969; 1971; 1979; Wittouck et al. 1995; Tiranti 1988; Labaroni et al. in press).

In the same line, *Macroakodon calilegua* is morphologically undistinguishable from *A. simulator*, a highly variable species in its external coloration and skull morphology (cf. Myers 1989; see also Table S5). In addition, the holotype of *M. calilegua* is a specimen collected over 40 years ago, visibly discolored (as several other figured species by Agnolin et al; e.g., *Euryoryzomys australis*). Some of the character states considered diagnostic of *M. calilegua* are probably the consequence of the poor state of conservation of the selected type specimens (e.g., “orejas muy pálidas”), constitute highly variable traits in species of *Akodon* in general and *A. simulator* in particular (e.g., “forámenes incisivos sobrepasan holgadamente el hipoflexo del M1”; cf. Myers 1989), or were erroneously described (Agnolin et al. stated that the species has “crestas parietales, supraorbitarias y nucales muy pronunciadas”, while in their comparisons they expressed “sin crestas supraorbitarias definidas.”). Finally, the only character considered autapomorphic by Agnolin et al. (“molares con gran hipsodontia”) is also present in at least another species of *Akodon* (*A. budini*; Thomas 1918) and, judging by the photos, is wrongly scored (i.e., the hipsodonty is moderate).

Brucepattersonius: Agnolin et al. did not propose any new taxa of the genus *Brucepattersonius*, but they argued in favor of the taxonomic distinction of *B. guarani* Mares & Braun 2000, *B. misionensis* Mares & Braun 2000, and *B. paradisi* Mares & Braun 2000. These three species were described from Misiones province by Mares & Braun (2000) based on only three specimens collected at nearby localities. The distinction of these species has been widely questioned in the literature, suggesting they represent synonyms of *B. iheringi* (Thomas, 1896) (e.g. Pereira et al. 2005; Cirignoli et al. 2011; Lanzone et al. 2018; Teta & D'Elía 2019). The supposedly diagnostic state characters of these taxa are “diluted” when large series of individuals are considered (see Pereira et al. 2005). At least, specimens CFA-MA-4570, CFA-MA-4978, CFA-MA-7543 (referred by Agnolin et al. to *B. guarani*), CFA-MA-4979 (referred to *B. misionensis*), and CFA-MA-6101 (referred to *B. paradisi*) do not depart morphologically from *B. iheringi* (Thomas 1896) (cf. Jung & Christoff 2003; Table S6). In addition, regarding *B. iheringi*, Agnolin et al. indicated that “Hershkovitz (1998) considera que esta especie debe ser excluida de la fauna argentina, lo cual es sostenido por Vilela et al. (2015, véase Pereira et al. 2005).” However, (Vilela et al. 2015; Map 101), based on external morphology and craniodental morphometric analyses, explicitly include this species in Argentina. In view of these claims and the molecular evidence provided by Dias (2016), which also recovered one single lineage for areas near northeastern Argentina, we kept that a single species of *Brucepattersonius* is known for this country, for which the applicable name is *B. iheringi*.

Necromys: Agnolin et al. did not propose any new taxa associated to *Necromys* Ameghino 1889 but argue for the distinction at the species level of the taxon *Bolomys temchuki elioi* Contreras 1982, under the new combination *Necromys elioi*. Agnolin et al. wrongly stated that “*N. t. elioi* fue originalmente nominada por Contreras (1982) sobre la base de numerosos ejemplares de la provincia de Chaco.” However, Contreras (1982) described *B. t. elioi* based on specimens from the eastern margin of the Paraná River, at Corrientes province; in turn, *B. t. liciae* Contreras 1982 was described based on specimens from Chaco and Formosa provinces in the western margin of the Paraná River. Agnolin et al. indicated that they revised the holotype, but the specimens listed and figured do not match any type material (see Table S7). Additionally, Agnolin et al. did not provide molecular neither morphometric evidence to support the specific distinctiveness of the nominal

form *elioi* Contreras, 1982, nor made any mention to *liciae* Contreras, 1982. The set of morphological features mentioned are dubious: small general size is not a clear cut (see Table S7 for comparison to nearby samples); the skull description is poor and lacks adequate comparative context; the skin description matches that of *liciae* in Contreras (1982) instead of *elioi*. Molecular and morphological evidence suggests that both *elioi* and *liciae* are synonyms of the widely distributed *N. lasiurus* (Lund 1840) (D'Elía et al. 2008), for which high level of qualitative and quantitative morphological variation has been reported (Contreras 1982; Macêdo & Mares 1987; Oliveira et al. 1998; Libardi 2013). Thus, we consider that the nominal form *elioi* should be retained as a full synonym of *N. lasiurus* (Lund 1840), until proper taxonomic revision is provided.

Oxymycterus: Agnolin et al. described two new species of *Oxymycterus* at the time that they argued for the distinction at the species level of *O. akodontius* Thomas 1921 and *O. platensis* Thomas 1914. Agnolin et al. suggested the possibility that all specimens of *Oxymycterus* from northwestern Argentina, previously assigned to *O. paramensis* Thomas 1902, be assigned to *O. akodontius*, which would be distinct at the species level from *O. paramensis*. These authors based this taxonomic and distributional proposal on the examination of just four Argentinean specimens (all from localities of the Orán Department, northern Salta Province) and relied on morphometric characters not properly reported (e.g., they mentioned size differences but do not inform results from any statistical analysis) and highly variable skin (“pelaje corto y áspero”) and skull (zygomatic plate development) traits. Furthermore, they omitted that this nominal form was included in the synonymy of *O. paramensis* in the recent taxonomic revision of the genus provided by Oliveira & Gonçalves (2015). Agnolin et al. also mentioned the observed genetic distance registered by Jayat et al. (2008a) among populations of *Oxymycterus* (referred to *paramensis*) from Peru, Bolivia, and northwestern Argentina as supporting evidence for the distinction of *O. akodontius*. Notwithstanding, Agnolin et al. did not mention that these authors recommend that “This relationship should be tested by comprehensive studies that must necessarily include the analysis of morphologic characters and topotypical specimens” (Jayat et al. 2008a : 48). A similar scenario is true for *Oxymycterus platensis*, a nominal form that, based on detailed analysis of qualitative and quantitative morphological traits and genetic analyses of samples from the La Plata basin, was included in the synonymy of *O. rufus* (Fischer

1814) by Gonçalves & Oliveira (2004). Agnolin et al. alleged that *O. platensis* and *O. rufus* could be differentiated mostly based on pelage color differences. However, Gonçalves & Oliveira (2004) showed that specimens with contrasting pelage tones bear negligible divergence in cranial traits and DNA sequences, suggesting that pelage color variation alone is not a good predictor of interspecific divergence in this case. In both cases of *O. akodontius* and *O. platensis*, Agnolin et al. supported species distinction based on variable pelage and cranial characters of limited taxonomic value, which were widely discussed and disregarded as taxonomically relevant by previous authors (Gonçalves & Oliveira 2004; see also Table S8). Therefore, we kept *O. akodontius* under the synonymy of *O. paramensis* and *O. platensis* in the synonymy of *O. rufus*.

Agnolin et al. described two new species of *Oxymycterus*, *O. contrerasi* and *O. massoi*; however, both taxa are morphologically undistinguishable from *O. rufus*, a widely distributed species in La Plata basin (Table S8). The analyses of Gonçalves & Oliveira (2004), which included topotypes of *O. contrerasi* (Arroyo Las Brusquitas, Buenos Aires), provided evidence for the recognition of a single species among the samples from Buenos Aires province. Most of the supposedly diagnostic traits of both *O. contrerasi* and *O. massoi* consist in pelage characters with low taxonomic significance, as commented above, or in cranial characters that are polymorphic within populations assigned to *O. rufus* (cf. Crespo 1964; Gonçalves & Oliveira 2004). Without further morphological and genetic comparisons, the few specimens of *O. contrerasi* ($n = 3$) found among extensive series of *O. rufus* from Buenos Aires should be regarded as representing intrapopulation variants of the highly variable *O. rufus* and not as evidence of sympatric species (contrary to Agnolin et al.). The same is true for *O. massoi* ($n = 2$), which do not differ from other samples from northeastern Argentina studied by Gonçalves & Oliveira (2004), including those from Corrientes province, where the type locality of *O. rufus* lies. In fact, when stating “*Oxymycterus rufus* Fischer, 1814: Esta especie cuenta con su localidad tipo en cercanías de San Ignacio, Paraguay (Contreras y Teta, 2003; D’Elía et al., 2008);” Agnolin et al. ignored that Oliveira & Gonçalves (2015) selected a neotype for *O. rufus* (specimen MLP 26.XII.01.05), and thus restricted the type locality of this species to “Estancia San Juan Poriahú, Depto. San Miguel, Provincia Corrientes, Argentina (27.71667°S, 57.19389°W).” Given these considera-

tions, we regard *O. contrerasi* and *O. massoi* as junior synonyms of *O. rufus*.

Tribe Oryzomyini Vorontsov 1959

Holochilini: Agnolin et al. erected this tribe to contain “...*Holochilus* (como género tipo), *Lundomys*, y los extintos *Carletonomys* (Pardiñas, 2008) y *Noronhomys* (Carleton y Olson, 1999). Posiblemente en este mismo grupo se incluya el género *Pseudoryzomys*.” In addition to not mentioning the fossil *Reigomys primigenus* (Steppan 1996) (= “*Holochilus*” *primigenus*), which has been evolutionarily associated with this group (Machado et al. 2014), as delimited, Holochilini is not monophyletic. Even though some earlier phylogenetic analyses recover a clade formed by the living genera *Holochilus* Brandt 1835, *Lundomys* Voss and Carleton 1993, and *Pseudoryzomys* Hershkovitz 1962 (Weksler 2006, also Steppan & Schenk 2017 but with low support), recent three loci based phylogenetic analyses indicate that *Lundomys* is distantly related to the clade formed by *Holochilus* and *Pseudoryzomys* (Brace et al. 2015; Hansson & Platt 2019). In addition, despite its content (e.g., even when limited to *Holochilus*, or to *Holochilus* and *Pseudoryzomys*), the recognition of Holochilini renders a paraphyletic Oryzomyini (see the topologies portrayed in Weksler 2006 and Brace et al. 2015), a situation not considered by Agnolin et al. Based on these considerations, we suggest to not recognize Holochilini as a distinct sigmodontine tribe, but as a synonym of Oryzomyini.

Euryoryzomys: Agnolin et al. described *Euryoryzomys australis* based on specimen CFA-MA-2399. However, this specimen is clearly a representative of the monotypic genus *Sooretamys* Weksler, Percequillo & Voss 2006 and not of *Euryoryzomys* Weksler, Percequillo & Voss 2006, as can be judged by the following combination of morphological traits: skull with long, and broad rostrum; interorbital region hourglass-shaped, with square supraorbital margins; nasals short, not extending posteriorly beyond lacrimal bones; parietals with broad lateral expansions; incisive foramina very long, extending between M1 alveoli; posterolateral palatal pits large and complex, recessed in deep fossae; mesopterygoid fossa penetrating anteriorly between maxillae but not between molar rows; protostylid present (cf. Weksler 2006). Agnolin et al. seem to confuse both genera, as most of the supposedly diagnostic traits of their new species of *Euryoryzomys* correspond in fact to *Sooretamys* (e.g., square supraorbital margins, large incisive foramina). This confusion is also evident in some of their comments, as for example when

indicating “...es posible que algunos ejemplares citados por Teta et al. (2007) como pertenecientes al género *Sooretamys*, procedentes de la provincia de Misiones (MACN-Ma 15588; véase Massoia, 1993) puedan ser también referidos a esta nueva entidad”. However, our direct inspection of specimen MACN-Ma 15588 corroborates its identity as *Sooretamys angouya* (Fischer, 1814). A recent study on the geographic variation of *S. angouya* (Chiquito et al. 2014), which covered the whole distribution of the species and analyzed morphological and genetic data, found that this taxon in fact represents a single species. Therefore, based on these points, we included *Euryoryzomys australis* under the synonymy of *Sooretamys angouya* (see also **Table S9**).

Oligoryzomys: Agnolin et al. proposed important taxonomic novelties regarding *Oligoryzomys* Bangs 1900; regrettably, the authors ignored some of the broad and recent studies relevant to the taxonomy of this genus when framing their taxonomic decisions. Contributions as those of González-Ittig et al. (2014), Da Cruz & Weksler (2018), Hurtado & D’Elía (2018; 2019b), and Rivera et al. (2018) are ineludible references when dealing with the taxonomy of *Oligoryzomys* including Argentinean forms.

Agnolin et al. described two new species of *Oligoryzomys* from northwestern Argentina, *Oligoryzomys lanosus* and *Oligoryzomys noa*. Our examination of a large series of individuals from the same general area, and the holotypes and part of the type series of both forms, together with the available evidence from molecular markers (e.g. Teta et al. 2013; Hurtado & D’Elía 2018; 2019a;b), allows us to cast serious doubts on the distinction of both nominal forms (see **Table S10**). Based on its phenotype, the type of *O. lanosus* (upper toothrow length = 4.1 mm) is undoubtedly referable to a young-adult specimen of *O. brendae* Massoia 1998; in turn, the paratype of this nominal form is morphologically indistinguishable from *O. flavescens occidentalis* Contreras & Rosi 1980 (upper toothrow length = 3.4 mm). The overall external and cranial morphology of *O. lanosus* (perhaps with the single exception of the “crestas supraorbitarias bien desarrolladas y expandidas”, which are not obvious in the holotype of this nominal form) is broadly coincident with the amended diagnosis of *O. brendae* provided by Teta et al. (2013) and the morphologic variation observed in its populations. In fact, both *O. brendae* and *O. lanosus* have their type localities in the same general area (San Javier, Tucumán) and occur at similar altitudes.

As was stated above, the holotype of the second allegedly new species, *O. noa*, is a specimen of *O. flavescens occidentalis*; while other specimens ascribed to *O. noa* belong to *O. chacoensis* (Myers & Carleton 1981) and *O. brendae*. When naming the two species of *Oligoryzomys*, Agnolin et al. did not consider the moderate to large intra- to inter-populational and ontogenetic variation that characterizes the species of this genus. For example, *O. noa* shares four out of five of its supposedly diagnostic state characters with *O. chacoensis* and *O. flavescens occidentalis* (i.e., the overall robustness of the skull and its bowed lateral profile, the absence of distinctive supraorbital shelves, and a lateral orangish line separating the dorsal and ventral colorations), the fifth (i.e., the ventral coloration) being variable among individuals (cf. Myers & Carleton 1981). Most of these characters are also recorded in some individuals of the other species present in the region, *O. brendae*. Our direct inspection of the holotype of *O. noa* allows us to determine it as indistinguishable from *O. flavescens occidentalis*, due to its small size (upper toothrow length = 3.2 mm), and nearly parallel interorbital borders. In the comments section of the treatment of *O. noa*, Agnolin et al. recognize some morphologic differences between specimens from Salta and Jujuy provinces with respect to those coming from Tucumán province (“Vale la pena remarcar que los ejemplares procedentes de Tucumán presentan el cráneo algo más estrecho, especialmente en la región interorbitaria, y el hocico más corto y estrecho que en los ejemplares de Salta y Jujuy.”). We think that these differences are the result of the mixture of specimens belonging to the different already known species mentioned above.

Finally, Agnolin et al. considered *O. flavescens antoniae* Massoia, 1983 as a different species, although they did not provide molecular or morphometric evidence to support their suggestion. Instead, these authors only listed some minor differences in external and cranial morphology, including several character states that are highly variable (e.g., external coloration) along the wide distributional range of *O. flavescens* (Waterhouse 1837) (cf. Massoia 1973a;b).

Briefly, we advocate including *Oligoryzomys noa* under the synonymy of *O. flavescens occidentalis* and *Oligoryzomys lanosus* under *O. brendae*, while maintained *O. flavescens antoniae* as part of *O. f. flavescens*. We consider that Agnolin et al. unnecessarily raised the number of names associated to *Oligoryzomys*, an already taxonomically complex genus that has direct

relevance to human health due to several species are reservoirs of Hantavirus strains (Levis et al. 1998).

Tribe Phyllotini Vorontsov 1959

Agnolin et al. described two new species of the genus *Calomys* Waterhouse 1837, *C. apostoli* and *C. yunganus*. We assessed the holotypes of both species. *Calomys apostoli* is morphologically undistinguishable from samples of the widely distributed *C. musculinus* (Thomas 1913). While at least two paratypes of *C. yunganus* (CFA-MA-4882, CFA-MA-4883) are morphologically indistinguishable from *C. musculinus*, its holotype cannot be morphologically distinguished from other large species of *Calomys*, such as *C. boliviae* (Thomas 1901), *C. callosus* (Rengger 1830), or *C. fecundus* Thomas 1926. These are cryptic species, which are mostly differentiated based on genetic and karyotypic data (e.g. Martínez et al. 2016). With the evidence at hand (i.e., only morphologic data) is not possible to distinguish *C. yunganus* from any of these species (see also Table S11); in other words, Agnolin et al. did not provide evidence sustaining the distinction of *C. yunganus*. Based on geographical and morphological grounds, we preliminarily place *C. yunganus* in the synonymy of *C. fecundus* (see also the recent publication by Pinotti et al. [2020], which shows that the single species of large *Calomys* present in the Yungas of Argentina and southern Bolivia is *C. fecundus*, supporting as such our suggestion).

FINAL CONSIDERATIONS

The easy access to information and data acquisition, as well as the increasing communication among scientists, have prompted relevant changes in taxonomic practice, notably the widespread adoption of an integrative approach (Dayrat 2005). Nowadays, most new taxonomic hypotheses rely on evidence coming from distinct data sources; this approach has proven to be essential towards the understanding of the taxonomic diversity of several groups. This scenario is particularly true for the taxonomic studies of living mammals (e.g. Patton et al. 2000; Gonçalves & Oliveira 2004; Jayat et al. 2010). Unfortunately, Agnolin et al. did not frame their study in this approach, a fact that as shown above presents several and serious deficiencies. A brief summary list of them, although surely incomplete, is as follow:

1) Some cases, such as the confusion between *Euryoryzomys* and *Sooretamys*, denote insufficient knowledge on basic aspects of South American mammal diversity and taxonomy.

2) Relevant literature was omitted or misunderstood in the description of all new taxa. For example, in the case of the genus *Akodon* most of the taxonomic decisions were taken disregarding current hypothesis of phylogenetic relationships (e.g., Jayat et al. 2010; Coyner et al. 2013). In another example, the description of two additional species of *Oxymycterus* is mostly in contradiction with the comprehensive analyses provided by Gonçalves & Oliveira (2004) for *O. rufus*.

3) Agnolin et al. did not provide a list of examined specimens; those few individualized specimens pertain to those of new type series and few others used in comparisons (e.g., five specimens of *Necromys lasiurus* collected at a small geographic area). Although listing the specimens studied is not regulated by the ICZN, it is among the minimum standards observed in any current reliable mammalian taxonomic study, especially those dealing with taxa recognized by their high level of genetic and morphological variability.

4) We are aware that the Code does not give provision on the kind of data needed to describe a new species, but current standards are clear within the community of mammal taxonomists. Most of the morphological descriptions of Agnolin et al. are limited to qualitative characters, which were poorly documented regarding quantification and understanding of individual, sexual, and ontogenetic variation. Neither univariate nor multivariate analysis of quantitative morphological characters were included, although this kind of analysis is routinely employed in taxonomic contributions (see Hurtado & D'Elía 2018 and Jayat et al. 2016 for an example of a new species of *Oligoryzomys* and *Necromys*, respectively; see also Libardi & Percequillo 2016, who evaluated the geographic variation of *E. russatus*; see also Abreu-Júnior et al. 2012, who evaluated the sexual dimorphism in the tribe Oryzomyini). We note that the table of measurements of the type specimens provided by Agnolin et al. also leaves out some relevant measurements, such as the molar series length, classically reported and frequently used to identify Neotropical mammals in general and sigmodontine rodents in particular (e.g. Patterson & Timm 1987; Musser et al. 1998). In the same line, most of the descriptions of Agnolin et al. relied mostly on external characters, and more specifically, fur coloration (e.g., *Macroakodon naranja*, *Conepatus carloschebezi*). Although useful, these external traits are prone to individual and geographic variation (not accounted on that contribution). Similarly, most of the samples studied by Agnolin et al. are more

Table 1
Nomenclatorial acts proposed by Agnolin et al. (2019) and our suggestions regarding them.

Order	Tribe	Subtribe	Genus	Species/Subspecies	Agnolin et al.	This work
Carnivora				<i>Conepatus carloschebezi</i>	New species	Synonym of <i>C. chinga</i>
				<i>Conepatus feuilleti</i>	Considered as a distinct species	Synonym of <i>C. chinga</i>
				<i>Conepatus humboldtii</i>	Considered as a distinct species	Synonym of <i>C. chinga</i>
				<i>Conepatus rex</i>	Considered as a distinct species	Synonym of <i>C. chinga</i>
Chiroptera			<i>Myotis yoli</i>	New species	Synonym of <i>M. chiloensis</i>	
Rodentia	Akodontini	Akodontina			New subtribe	Not new and not needed
		Oxymycterina			Regarded at the subtribal level and distinct from Akodontina	Unavailable; synonym of Akodontini
			<i>Albakodon</i>	New genus	Do not use until an adequate review	
			<i>Hypsomys</i>	Considered as a distinct genus	Maintained in the synonymy of <i>Akodon</i>	
			<i>Mimiakodon</i>	New genus	Unavailable (no type species designed)	
			<i>Macroakodon</i>	New genus	Regarded as a distinct species as <i>A. bibiana</i>	Retained as <i>Akodon azarae bibiana</i>
			<i>Akodon azarae bibiana</i>			
			<i>Mimiakodon rumbolli</i>	New species	New species	Synonym of <i>A. azarae</i>
			<i>Mimiakodon chebezi</i>	New species	New species	Synonym of <i>A. azarae</i>
			<i>Mimiakodon azarae pautassoi</i>	New subspecies	New subspecies	Synonym of <i>A. azarae bibiana</i>
			<i>Macroakodon naranja</i>	New species	New species	Synonym of <i>A. dolores</i>
			<i>Macroakodon calel</i>	New species	New species	Synonym of <i>A. dolores</i>
			<i>Macroakodon calligua</i>	New species	New species	Synonym of <i>A. simulator</i>
			<i>Bolomys temchuki elioi</i>	Regarded as a distinct species, <i>Necromys elioi</i>	Regarded as a distinct species, <i>Necromys elioi</i>	Synonym of <i>N. lasiurus</i>
			<i>Oxymycterus contrerasi</i>	New species	New species	Synonym of <i>O. rufus</i>
			<i>Oxymycterus massoiai</i>	New species	New species	Synonym of <i>O. rufus</i>
			<i>Oxymycterus platensis</i>	Regarded as a distinct species	Regarded as a distinct species	Synonym of <i>O. rufus</i>
			<i>Oxymycterus akodontius</i>	Regarded as a distinct species	Regarded as a distinct species	Provisionally maintained as synonym of <i>O. paramensis</i>
			<i>Brucepattersonius paradisis</i>	Regarded as a distinct species	Regarded as a distinct species	Synonym of <i>B. iheringi</i>
			<i>Brucepattersonius guarani</i>	Regarded as a distinct species	Regarded as a distinct species	Synonym of <i>B. iheringi</i>
			<i>Brucepattersonius misionensis</i>	Regarded as a distinct species	Regarded as a distinct species	Synonym of <i>B. iheringi</i>
	Holochilini				New tribe	Synonym of Oryzomyini
			<i>Euryoryzomys australis</i>	New species	New species	Synonym of <i>S. angouya</i>
			<i>Oligoryzomys lanosus</i>	New species	New species	Synonym of <i>O. brendae</i>
			<i>Oligoryzomys noa</i>	New species	New species	Synonym of <i>O. flavescens occidentalis</i>
			<i>Oligoryzomys flavescens antoniae</i>	Regarded as a distinct species, <i>O. antoniae</i>	Regarded as a distinct species, <i>O. antoniae</i>	Synonym of <i>O. flavescens flavescens</i>
			<i>Calomys apostoli</i>	New species	New species	Synonym of <i>C. muscalinus</i>
	Phyllotini		<i>Calomys yunganus</i>	New species	New species	Synonym of a large body species of <i>Calomys</i> , probably <i>C. fecundus</i>

than 40 years old, a condition that unfortunately might affect their pigmentation. During specimen storage in museum collections, melanin-based colors may change over time due to chemical or structural degradation (Sandoval Salinas et al. 2018). Some of the species described, as *Euryoryzomys australis*, exhibit this problem.

5) No molecular or karyological evidence was provided to support any of the nomenclatorial acts advanced. Even when this is not mandatory to describe a new species, it is a common practice in the current descriptions of new mammal species (see a quantification for rodents in D'Elía et al. 2019) and has proven essential for those genera including cryptic diversity, such as *Calomys*, *Necomys*, and *Oligoryzomys* (e.g. Hurtado & D'Elía 2018). Overall, there is a clear bias against molecular-based contributions, which is essential to adequately contextualize the supposedly new species, particularly in genera as *Akodon*, *Calomys* and *Oligoryzomys*, as well as the supraspecific units.

6) None of the supposedly new species and subspecies is allopatric with the species that we considered as their senior synonyms. On the contrary, they have largely overlapping geographical ranges, as it is the case of *Macroakodon calel* and *Macroakodon naranja* with the widely distributed *Akodon dolores*. Moreover, the newly proposed *Oligoryzomys lanosus* has its type locality in the same general area of the one corresponding to *Oligoryzomys brendae*. Agnolin et al. did not realize or minimized these situations.

7) Several of the figures provided by Agnolin et al. for some holotypes (e.g., *Oligoryzomys antoniae* [Figs. 6 and 7], *Oligoryzomys noa* [Figs. 8-10], *Oligoryzomys lanosus* [Figs. 11-13], "*Miniakodon*" *rumbolli* [Figs. 19-21], "*Miniakodon*" *chebezi* [Figs. 22-24], "*Miniakodon*" *azarae pautassoi* [Figs. 25-27], *Macroakodon naranja* [Figs. 28-30], and *Calomys yunganus* [Figs. 57-59]) are of poor quality, not allowing the evaluation of the characters referred in the descriptions. In addition, several other figures present wrong scales (e.g., Figs. 3, 16, 18, 29, 32, 35, 38, 42, and 44) or misspelled specific names (e.g., "*Hypsomys budín*" in Fig. 14).

The work of Agnolin et al. added 14 new species and one subspecies endemic to Argentina, an action that has consequences for several research areas beyond taxonomy and systematics. As such, other disciplines, such as biogeography and specially conservation biology, would also be negatively affected. Similarly, in disciplines related to human health research the actions taken by Agnolin et al. might

also have undesirable consequences. Based on the available molecular and morphological evidence, there are three species of the genus *Oligoryzomys* in northwestern Argentina (e.g. Jayat et al. 2008b; Teta et al. 2013). After a long period of uncertainty, two of those forms, *O. chacoensis* and *O. flavescens occidentalis*, were identified as reservoirs of Hantavirus (see a synthesis in González-Iltig et al. 2014). Adding two unnecessary new species level names of this genus, *O. lanosus* and *O. noa*, causes at least undesirable confusion from an epidemiological perspective. Therefore, we expect that after our contribution, where the new species and subspecies described by Agnolin et al. are regarded as synonyms of others already known species (Table 1), those interested in other research areas, in particular conservation biology and epidemiology, disregard the taxa described by Agnolin et al., not expending already limited time, energy, and resources in conservation efforts for these taxa.

Similar problems are found in relation to the new supraspecific taxa. In addition to failures to accomplish some requirements of the International Code of Zoological Nomenclature (ICZN 1999; 2012) that make unavailable two of the five proposed supraespecific taxa, their proposition is made almost without considering phylogenetic context, which is contrary to systematic practices well established decades ago.

Overall, the work of Agnolin et al. is an example of inadequate taxonomic practice. This kind of contribution can confuse medical and epidemiologist professionals, needlessly complicate conservation efforts, disrupt grant administration, and, more important, negatively affect public perception of science, and of taxonomy and systematics by colleagues cultivating other biological disciplines.

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CONICET, they have no connection with the División Mastozoología of this institution.

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APPENDIX 1

Appendix 1: List of specimens used for comparisons (see also specimen lists in the publications indicated in Material and Methods). Acronyms are as follows: AUC: field catalog of Alexandre Uarh Christoff; BMNH: British Museum of Natural History (London, UK); MACN-Ma, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (Buenos Aires, Argentina); CFA-MA, Fundación de Historia Natural Félix de Azara (Buenos Aires, Argentina); MCNU, Museu de Ciências Naturais, Universidade Luteraana do Brasil (Canoas, Brazil); MPEG: Museu Paraense Emílio Goeldi (Belém, Brazil); UFRGS: Universidade Federal do Rio Grande do Sul (Porto Alegre, Brazil).

Akodon azarae (n = 56): MACN-Ma 14422, MACN-Ma 14424, MACN-Ma 14484, MACN-Ma 14620, MACN-Ma 14640, MACN-Ma 14922, MACN-Ma 14924, MACN-Ma 14926, MACN-Ma 14927, MACN-Ma 14928, MACN-Ma 14929, MACN-Ma 14930, MACN-Ma 14931, MACN-Ma 14932, MACN-Ma 14938, MACN-Ma 14943, MACN-Ma 14947, MACN-Ma 14953, MACN-Ma 14956, MACN-Ma 14960, MACN-Ma 14964, MACN-Ma 14986, MACN-Ma 14988, MACN-Ma 14989, MACN-Ma 14990, MACN-Ma 14991, MACN-Ma 14992, MACN-Ma 14994, MACN-Ma 14996, MACN-Ma 14998, MACN-Ma 15352, MACN-Ma 15354, MACN-Ma 15356, MACN-Ma 15357, MACN-Ma 15359, MACN-Ma 16229, MACN-Ma 16294, MACN-Ma 16297, MACN-Ma 16506, MACN-Ma 17788, MACN-Ma 17789, MACN-Ma 17790, MACN-Ma 17791, MACN-Ma 17793, MACN-Ma 18143, MACN-Ma 18161, MACN-Ma 18162, MACN-Ma 18163, MACN-Ma 18164, MACN-Ma 18165, MACN-Ma 18166, MACN-Ma 18169, MACN-Ma 18177, MACN-Ma 18592, MACN-Ma 18593, MACN-Ma 18594.

Akodon dolores (n = 89): MACN-Ma 13310, MACN-Ma 13312, MACN-Ma 13322, MACN-Ma 13325, MACN-Ma 14587, MACN-Ma 14588, MACN-Ma 14589, MACN-Ma 14720, MACN-Ma 14721, MACN-Ma 14732, MACN-Ma 14942, MACN-Ma 14952, MACN-Ma 14963, MACN-Ma 14965, MACN-Ma 14966, MACN-Ma 15285, MACN-Ma 15287, MACN-Ma 15289, MACN-Ma 15290, MACN-Ma 15292, MACN-Ma 15295, MACN-Ma 15296, MACN-Ma 15298, MACN-Ma 15299, MACN-Ma 15312, MACN-Ma 15315, MACN-Ma , MACN-Ma 15321, MACN-Ma 15326, MACN-Ma 15373, MACN-Ma 15375, MACN-Ma 15376, MACN-Ma 15381, MACN-Ma 15470, MACN-Ma 15471, MACN-Ma 15473, MACN-Ma 15474, MACN-Ma 15475, MACN-Ma 15476, MACN-Ma 15477, MACN-Ma 15479, MACN-Ma 15536, MACN-Ma 15537, MACN-Ma 15538, MACN-Ma 15542, MACN-Ma 15545, MACN-Ma 15546, MACN-Ma 15548, MACN-Ma 15552, MACN-Ma 15557, MACN-Ma 15558, MACN-Ma 15561, MACN-Ma 15575, MACN-Ma 15577, MACN-Ma 15578, MACN-Ma 15581, MACN-Ma 27718, MACN-Ma 27719, MACN-Ma 27720, MACN-Ma 27721, MACN-Ma 27722, MACN-Ma 27723, MACN-Ma 27724, MACN-Ma 27725, MACN-Ma 27726, MACN-Ma 27727, MACN-Ma 27728, MACN-Ma 27729, MACN-Ma 27730, MACN-Ma 27731, MACN-Ma 27732, MACN-Ma 27733, MACN-Ma 27734, MACN-Ma 27735, MACN-Ma 27736, MACN-Ma 27737, MACN-Ma 27738, MACN-Ma 27739, MACN-Ma 27740, MACN-Ma 27741, MACN-Ma 27742, MACN-Ma 27743, MACN-Ma 27744, MACN-Ma 27745, MACN-Ma 27746, MACN-Ma 28110, MACN-Ma 28112, MACN-Ma 28132, MACN-Ma 28174.

Bucepattersonius iheringi (n = 30): MACN-Ma 17670, MACN-Ma 18951, MACN-Ma 18952, MACN-Ma 18953, MACN-Ma 19225, MACN-Ma 21383, MACN-Ma 22247, MACN-Ma 22248, MACN-Ma 22249, MACN-Ma 22250, MACN-Ma 22251, MACN-Ma 22252, CFA-MA-4570, CFA-MA-4978, CFA-MA-4979, CFA-MA-6101, CFA-MA-7543, MCNU 096, MCNU 113, MCNU 114, MCNU 1462, MCNU 1463, MCNU 1464, MCNU 1465, MCNU 1466, MCNU 2707, MCNU 595, MCNU 599, MCNU 600, MCNU 624.

Calomys apostoli (n = 1): CFA-MA-3509 (holotype).

Calomys yunganus (n = 2): CFA-MA-4882 (paratype), CFA-MA-4883 (paratype).

Conepatus carloschebezi (n = 1): MACN-Ma 47.119 (holotype).

Euryoryzomys australis (n = 3): CFA-MA-2399 (holotype), CFA-MA-2396 (paratype), CFA-MA-2398 (paratype). *Euryoryzomys russatus*

(n = 7): AUC 8, BMNH 895201, MACN-Ma 18504; MACN-Ma 18888, MACN-Ma 18889, MPEG 23540; UFRGS 1080.
Macroakodon calel (n = 1): CFA-MA-12266 (holotype).
Macroakodon calilegua (n = 1): CFA-MA-4881 (holotype).
Macroakodon naranja (n = 1): CFA-MA-2867 (holotype).
 “*Miniakodon*” *azarae pautassoi* (n = 1): CFA-MA-12261 (holotype).
 “*Miniakodon*” *chebezi* (n = 1): CFA-MA-12251 (holotype).
 “*Miniakodon*” *rumbolli* (n = 1): CFA-MA-3339 (holotype).
Myotis yoli (n = 1): CFA-MA-5237 (holotype).
Necromys lasiurus (n = 47): MCNU 2062, MCNU 2063, MCNU 2064, MCNU 2066, MCNU 2069, MCNU 2070, MCNU 2071, MCNU 2072, MCNU 2076, MCNU 2078, MCNU 2079, MCNU 2081, MCNU 2082, MCNU 2084, MCNU 2101, MCNU 2104, MCNU 2106, MCNU 2107, MCNU 2108, MCNU 2110, MCNU 2154, MCNU 2156, MCNU 2159, MCNU 2161, MCNU 2162, MCNU 2163, MCNU 2165, MCNU 2614, MCNU 2616, MCNU 2617, MCNU 2618, MCNU 2619, MCNU 2620, MCNU 2624, MCNU 2627, MCNU 2628, MCNU 2629, MCNU 2631, MCNU 2632, MCNU 2633, MCNU 2634, MCNU 2635, MCNU 2636, MCNU 2637, MCNU 2638, MCNU 2641, MCNU 2646.
Oligoryzomys flavescens antoniae (n = 1): CFA-MA-6045 (holotype).
Oligoryzomys lanosus (n = 2): CFA-MA 5856 (holotype), CFA-MA-5857 (paratype).

Oligoryzomys noa (n = 5): CFA-MA-3999 (holotype), CFA-MA-3985 (paratype), CFA-MA-5874 (paratype), CFA-MA-5875 (paratype), CFA-MA-5884 (paratype).
Oxymycterus contrerasi (n = 3): CFA-MA-13392 (= C-00793) (holotype), CFA-MA-13393 (paratype), CFA-MA-13394 (paratype).
Oxymycterus massoiai (n = 2): CFA-MA-3551 (holotype), CFA-MA-3552 (paratype).

ONLINE SUPPLEMENTARY MATERIAL

Suplement 1

Tables. S1-S11. Summary statistics [mean \pm SD (range) n] of cranial measurements (in mm) of adult samples of distinct mammal samples corresponding to the species recognized here and those described by Agnolin et al. (2019).