Details for fossil data hand-cleaning based on authors’ expertise.

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Lucas Buffan1,2, Fabien L. Condamine2, Laurent Marivaux2, François Pujos3,4, Narla S. Stutz 2,5, and Pierre-Olivier Antoine2

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1Département de Biologie, École Normale Supérieure de Lyon, Université Claude Bernard Lyon 1, 69342 Lyon Cedex 07, France.

2CNRS, UMR 5554 Institut des Sciences de l’Évolution de Montpellier, Place Eugène Bataillon, 34095 Montpellier, France.

3Consejo Nacional de Investigaciones Científicas y T ́ecnicas (CONICET), Argentina

4Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA), CCT-CONICET-Mendoza, Av. Ruiz Leal s/n, ParqueGral, San Martín 5500, Mendoza, Argentina

5Programa de P ́os-Graduaç ̃ ao em Geociˆencias, Universidade Federal do Rio Grande do Sul (PPGGEO UFRGS), Avenida Bento Gonçalves, 9500, 91501-970, Porto Alegre, Brazil

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**Corresponding author:** Lucas.L.Buffan@gmail.com

# Artiodactyla

*Palaeolama sp.* (coll. nb. 213138, [1]), *Lama castelnaudi* (coll. nb. 213136, [1]) and *Palaeolama weddeli* (coll. nb. 213136, [1]) age ranges were set to Early Pleistocene, according to [2].  
All *Bos taurus* and *Ovis* occurrences were removed, as representatives were introduced by humans.  
*Antifer crassus* (coll. nb. 53926, [3]) time range was set to Pleistocene according to [4]. *Platygonus narinoensis* (coll. nb. 133585, [5]) was renamed *Platygonus cf. marplatensis* according to [6].  
All occurrences of *Cervus gouazoubira* were renamed *Mazama gouazoubira*.

# Astrapotheria

*Grypolophodon imperfectus* (coll. nb. 176290, [7]) was removed as nomen dubium.  
*Parastrapotherium holmbergi* (coll. nb. 176290, [8]) formation was set to Sarmiento, stage to Deseadan-Colehuehuappian, and age range to 20-29 Ma.  
*Xenastrapotherium sp.* (coll. nb. 55602, [9]) and *Xenastrapotherium amazonense* (coll. nb. 55602, [10]) were reassigned to Laventan stage (11.8-13.8 Ma) according [11].  
*Notorhinus denticulatus* (coll. nb. 176290, [8]) removed as nomen dubium. *Astrapotherium* (coll. nb. 50074, [12]) re-assigned to Santacrucian.

# Carnivora

Removed *Felis domesticus* (coll. nb. 190846, [13]) as introduced by humans.

# Cetacea

# Cingulata

Cleaning was made based on the expertise of F. Pujos, and details of the procedure are available in the ./data\_2023/cleaning\_Xenarthra/Xenarthra\_FP\_2.0.xlsx table, sheet *Cingulata*. Rows highlighted in red (n=261) have been further removed for the rest of the study. Taxon names, ages, localities and formations were updated in red when needed.

# Chiroptera

# Didelphimorphia

Added one occurrence of the extant genus *Chacodelphys* [14].  
All occurrences assigned to the *Micoureus* genus were re-assigned to the *Marmosa* genus, the former being a sub-genus of the latter [15].  
Based on [16], we added a new occurrence of Marmosa in the TAR-31 locality of Shapaja, Peru, Middle-Late Miocene (11.67-15.63 Ma).  
*Paradidelphys sp.* (coll. nb. 157795, [17]) was synonymised with *Thylophorops*.  
Added one occurrence of *Thylamys cf. colombianus* from the TAR-31 locality of Shapaja, Peru [15].

# Litopterna

*Archaeohyracotherium mediale* (*Didolodontidae*, coll. nb. 176164, [7]) was synonymised with *Asmithwoodwardia subtrigona* (*Protolipternidae*) by Gelfo (2006)[18].  
*Argyrolambda conidens* was synonymised with *Didolodus multicuspis* [18].  
*Didolodus sp.* (coll. nb. 199563, [19]) was removed as associated to “unidentified *Didolontidae*” in the paper. *Enneoconus parvidens* (coll. nb. 176164, [20]) was synonymised with *Ernestokokenia nitida* by Gelfo (2006)[18].

# Microbiotheria

# Notoungulata

#No order *Wirunodon chanku* (coll. nb. 149523, [21]) age range was set to Early Oligocene (28.7-33.9 Ma). The three occurrences of the *Rumiodon* genus were attributed to Early Oligocene (28.7-33.9 Ma) All occurrences of the *Protodidelphis* genus were attributed to Late Palaeocene-Early Eocene (47.8-59.2 Ma), just like all occurrences from the *Carolopaulacoutoia* and *Didelphopsis* genera.

# Paucituberculata

*Actestodon* genus was synonimised with *Actestis* Added one occurrence *aff. Palaeothentes* from the TAR-31 locality of Shapaja, Peru [15]. *Propalaeothentes* was synonimised with *Palaeothentes*.

# Perissodactyla

*Equus sp.* (coll. nb. 142016, [22]) was set to *Equus (Amerhippus)*. Together with *Equus sp.* (coll. nb. 71275, [23]; coll. nb. 70673, [24]; coll. nb. 92814, [25]), *Equus (Amerhippus)* (coll. nb. 70673, [26]) and *Hippidion sp.* (coll. nb. 70673, [26]), their upper time boundary were set to 0.99 Ma, according to MacFadden (2013) [27].  
*Equus sp.* (coll. nb. 142158 and 142160, [28]) were both set to *Equus (Amerhippus)*.  
*Equus asinus* (coll. nb. 190844, [13]) was removed as introduced by humans.  
*Equus caballus* (coll. nb. 63337, [29]) was set *Equus (Amerhippus) neogeus* by Alberdi and Prado (1992) [30].  
*Equus caballus* (coll. nb. 70704, [26]) time range was set to Holocene.  
*Equus caballus* (coll. nb. 142016, [22]) was set to *Equus (Amerhippus) insulatus*.  
*Equus caballus* (coll. nb. 73842, [31]) time range was set to Pleistocene by [32].  
*Equus santaeelenae* (coll. nb. 144922, 145506, [33]) time ranges were adjusted to Late Pleistocene.  
*Hippidium (Plagiohippus)* (coll. nb. 71304, [34]) name was set to *Hippidion* [30].  
*Hypohippidium humahuaquense* (coll. nb. 210722, [35]) was synonymised with *Hippidion devillei* by [30] *Hippidion sp.* (coll. nb. 73842, [31]; coll. nb. 199157, [36]; coll. nb. 53926, [3], 2 occurrences) time ranges were adjusted to Pleistocene.  
*Tapirus (Tapilarum)* (coll. nb. 53928, [3]) name was shortened to *Tapirus*, and age set to Early Pleistocene.  
*Tapirus oliverasi* (coll. nb. 146534, [37]) species name was removed as doubtful [38], occurrence therefore renamed *Tapirus*. *Tapirus tarijensis* (coll. nb. 70673, [26]) lower age boundary was set to 1.06 Ma.

# Pilosa

Cleaning was made based on the expertise of F. Pujos, and details of the procedure are available in the ./data\_2023/cleaning\_Xenarthra/Xenarthra\_FP\_2.0.xlsx table, sheet *Pilosa*. Rows highlighted in red (n=180) have been further removed for the rest of the study. Taxon names, ages, localities and formations were updated in red when needed.

# Polydolopimorphia

*Chulpasia sp.* (coll. nb. 132938, [39]) was removed as only one record of *Chulpasia* (species *mattaueri*) has been found in Peru.  
*Groeberia minoprioi* (coll. nb. 92669, [40]) age range was set to Late Eocene-Early Oligocene (27.82-37.71 Ma).  
*Marmosopsis sp.* (coll. nb. 133039, [41]) age range was set to Late Palaeocene-Early Eocene (47.8-59.2 Ma).  
*Patagonia peregrina* (coll. nb. 27311, [42]) age range was set to Chattian (23.03-27.82 Ma). All occurrences of *Polydolops clavulus* were renamed *Archaeodolops clavulus*, according to [43]. Added one occurence of *Archaeodolops clavulus*, according to the same paper.  
All occurrences of *Proargyrolagus bolivianus* were attributed to the Salla formation, Bolivia. Hence, their age boundaries were restricted to 24.5-26 Ma.  
*Amphidolops serrula* (coll. nb. 13779, [44]) was re-assigned to Late Palaeocene (oldest recorded Polydolopid).  
*Polydolops sp.* (coll. nb. 14208, [45]) was removed as age boundaries (Early Miocene) were way outside known boundaries for records of this genus (Middle Eocene).  
Added occurrence from a newly described genus of the Peridolopidae family from the TAR-74 locality of San Martín, named *Peridolopidae\_gen\_A* [19].

# Primates

# Proboscidea

*Mastotherium hyodon* (coll. nb. 142016, [22] and 145181, [46]) genus named was set to *Cuvieronius*.  
*Stegomastodon sp.* (coll. nb. 211646, [47]) was synonymised with *Notiomastodon platensis*.  
All mentions of *Mammut* were removed. *Notiomastodon platensis* (coll. nb. 144515, [48]), formerly described as *Amahuacatherium peruvianum* was removed as its age was questioned in [49].

# Rodentia

## Added Occurrences

*Ricardomys longidens*, Laventan age, San Martín department, Peru [50].  
*Microscleromys sp.* (two occurrences), *Microscleromys cribriphilus*, *Microscleromys paradoxalis*, *Microsteiromys jacobsi*, *Nuyuyomys chinqaska*, *Scleromys*, Laventan age, San Martín department, Peru [50].  
*Balsayacuy sp.*, Rupelian age (restricted to the 27.82-31.1 Ma interval), Departamento de Ucayali, Santa Rosa locality, Peru [51]. Described as an occurrence of *Balsayacuy huallagaensis*, but species attribution doubtful. Hence, restricted to genus level. From the same paper (same locality and same age), we also add one occurrence of *Shapajamys minor*, one of *Ucayalimys amahuacensis* and one of *Vucetichimys pterilophodonica*.  
*Erethizon sp.*, Vorohuean (Marplatan) age, Uquía formation, Quebrada de Humahuaca locality, Jujuy state, Argentina [52].  
*Eoincamys valverdei* and *Tarapotomys subandinus*, Early Oligocene of resp. TAR-72 and TAR-22, San Martín, Peru [53].

## Corrections

*Cachiyacuy contamanensis* (coll. nb. 149523, [54]) was renamed *Cachiyacuy sp.* as taxonomic assignation under debate. Two *Cachiyacuy contamanensis* occurrences from the same collection, same paper, were renamed *cf. Cachiyacuy contamanensis*, for the same reason.  
*Kichkasteiromys raimondii*: age range set to 34-35 Ma.  
Time boundaries of *Cachiyacuy cf. contamanensis* and *Cachiyacuy contamanensis* (coll. nbs. 207061 and 207062, [55]) were set to Priabonian (33.9-37.2 Ma). Same for *Cachiyacuy cf. kummeli*, *Eoespina* and *cf. Eoespina* (coll. nb. 207062, 207062 and 207065, [55]) Remaning occurrences of the genus *Cachiyacuy* (four in total) were set to Late Eocene (33.9-41.2 Ma).  
*Canaanimys maquiensis* (coll. nb. 149523, [54]) was renamed *Canaanimys sp.* as taxonomic assignation under debate.

Time boundaries of four *Cachiyacuy kummeli* occurrences (coll. nb. 144474, [56]; 176136, [57], 207067 and 207062 [55]) were set to Bartonian-Priabonian (33.9-41.2 Ma). Same for *Eobranisamys sp.* (coll. nb. 176151, [57]) and for all occurrences from the 144474 collection, including one *Chachapoyamys cf. kathetos* [50], one *Eoespina sp.* [56], one *Canaanimys maquiensis* [56] and one *Eobranisamys javierpardoi* [57].  
Ages of all occurrences from the collection 149523 were restricted to Rupelian. These included two *cf. Cachiyacuy kummeli* occurrences [54], one *Canaanimys sp.* [54], one *Eobranisamys riverai*, one *Eobranisamys romeropittmanae*, one *Eoespina woodi*, one *Eoincamys ameghinoi*, one *Eoincamys pascuali*, one *Eopicure kraglievichi*, one *Eosachacui lavocati*, one *Eosallamys paulacoutoi*, one *Eosallamys simpsoni* [58], one *Pozomys sp.*, two *Pozomys ucayalensis* [54], one *Eodelphomys almeidacomposi*, one *Eopululo wigmorei* [58].  
Ages of two *Sallamys pascuali* occurrences (coll. nb. 95688, [59]; 133539, [60]), three *Branisamys luribayensis* (coll. nb. 95688 [59]; 95688 [61]; 133539 [60]) were sharpened to the 25-26 Ma interval.  
Ages of one *Pozomys ucayalensis* (coll. nb. 176129, [57]) were set to Bartonian-Priabonian (33.9-41.2 Ma). Ages of two *Eoespina sp.* occurrences (coll. nb. 176140, [57]) was restricted to Late Eocene.  
Ages of one *Eoespina* and one *cf. Eoespina* occurrence (coll. nb. 207062 and 207065, [55]) were set to Rupelian.  
*Eoincamys pascuali* (coll. nb. 207064, [55]) was renamed *Eonincamys sp.*. Age range of all Late Oligocene occurrences from the Salla formation, La Paz, Bolivia, was set to 24.5-26 Ma. *Eopululo wigmorei* (coll. nb. 225588, [19]) species name was set to *Eopululo sp.* according to [50].  
Names of all *Eumysops chapalmalensis* occurrences were set to *Eumysops chapadmalensis*.

## Removed occurrences

*Cachiyacuy kummeli* (coll. nb. 207067, [55]), renamed *C. cf. kummeli* (doublon) according to [50].  
*Canaanimys sp.* (coll. nb. 176136, [62]), taxonomic revision [50].  
*Canaanimys maquiensis* (two occurrences, coll. nb. 207066 and 207067, [55]), taxonomic revision [50].  
*Chachapoyamys kathetos* (coll. nb. 207067, [50]), re-assigned to *C. cf. kathetos* (doublon) [50].  
Four Brazilian occurrences of the genera *Eobranisamys* (two) and *Eoincamys* (two) with absurd ages (coll. nb. 57989, [63]; coll. nb. 217834, [64]).  
*Tarapotomys sp.* (2 occurrences) (coll. nb. 199560, [53]; coll. nb. 199563, [19]), respectively re-described as *aff. Tarapotomys sp.* and *Tarapotomys subandinus* in [50].  
*Incamys bolivianus* (coll. nb. 95688, [59]), doulon.  
*Asteromys bolivianus* (coll. nb. 133591, [65]), doublon.  
All *Rattus rattus* occurrences, as introduced by humans.

# Sparassodonta

Cleaning was highly based on Tarquini et al. 2022 [66]. In addition, we removed our single *Argyrolestes peralestinus* occurrence (coll. nb. 176285, [67]) as nomen nubidum [68]

# Xenungulata

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