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

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# 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.  
Added one occurrence of *Cyonasua sp.* from the Maimará formation, Maimará locality, Jujuy, Argentina [14].

# 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.  
Added one occurrence of *Eosclerocalyptus* (6.4-6.6 Ma), *Doellotatus chapadmalensis* (5.9-6 Ma) and *Macrochorobates scalabrinii* (6.4-6.6 Ma) from the Maimará formation, Maimará locality, Jujuy, Argentina [14].

# Chiroptera

# Didelphimorphia

Added one occurrence of the extant genus *Chacodelphys* [15].  
All occurrences assigned to the *Micoureus* genus were re-assigned to the *Marmosa* genus, the former being a sub-genus of the latter [16].  
Based on [17], 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, [18]) was synonymised with *Thylophorops* [19].  
Added one occurrence of *Thylamys cf. colombianus* from the TAR-31 locality of Shapaja, Peru [16].  
Added one occurrence of *Sparassocynus maimarai* from the Maimará formation, Maimará locality, Jujuy, Argentina [14].

# Litopterna

*Archaeohyracotherium mediale* (*Didolodontidae*, coll. nb. 176164, [7]) was synonymised with *Asmithwoodwardia subtrigona* (*Protolipternidae*) by Gelfo (2006)[20].  
*Argyrolambda conidens* was synonymised with *Didolodus multicuspis* [20].  
*Didolodus sp.* (coll. nb. 199563, [21]) was removed as associated to “unidentified *Didolontidae*” in the paper. *Enneoconus parvidens* (coll. nb. 176164, [22]) was synonymised with *Ernestokokenia nitida* by Gelfo (2006)[20].

# Microbiotheria

*Clenia brevis* was excluded from the *Clenia* genus by Goin and Abello (2013) [23]. Hence, we rename the genus *aff\_Clenia*.

# Notoungulata

#No order *Wirunodon chanku* (coll. nb. 149523, [24]) 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* [25]. Added one occurrence *aff. Palaeothentes* from the TAR-31 locality of Shapaja, Peru [16]. *Propalaeothentes* was synonimised with *Palaeothentes* [25]. Added *Palaeopanorthus primus* from the Colhuehuappuian of Chubut, Argentina [25].

# Perissodactyla

*Equus sp.* (coll. nb. 142016, [26]) was set to *Equus (Amerhippus)*. Together with *Equus sp.* (coll. nb. 71275, [27]; coll. nb. 70673, [28]; coll. nb. 92814, [29]), *Equus (Amerhippus)* (coll. nb. 70673, [30]) and *Hippidion sp.* (coll. nb. 70673, [30]), their upper time boundary were set to 0.99 Ma, according to MacFadden (2013) [31].  
*Equus sp.* (coll. nb. 142158 and 142160, [32]) were both set to *Equus (Amerhippus)*.  
*Equus asinus* (coll. nb. 190844, [13]) was removed as introduced by humans.  
*Equus caballus* (coll. nb. 63337, [33]) was set *Equus (Amerhippus) neogeus* by Alberdi and Prado (1992) [34].  
*Equus caballus* (coll. nb. 70704, [30]) time range was set to Holocene.  
*Equus caballus* (coll. nb. 142016, [26]) was set to *Equus (Amerhippus) insulatus*.  
*Equus caballus* (coll. nb. 73842, [35]) time range was set to Pleistocene by [36].  
*Equus santaeelenae* (coll. nb. 144922, 145506, [37]) time ranges were adjusted to Late Pleistocene.  
*Hippidium (Plagiohippus)* (coll. nb. 71304, [38]) name was set to *Hippidion* [34].  
*Hypohippidium humahuaquense* (coll. nb. 210722, [39]) was synonymised with *Hippidion devillei* by [34] *Hippidion sp.* (coll. nb. 73842, [35]; coll. nb. 199157, [40]; 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, [41]) species name was removed as doubtful [42], occurrence therefore renamed *Tapirus*. *Tapirus tarijensis* (coll. nb. 70673, [30]) 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.  
Added one occurrence of *Proscelidodon* (Upper Miocene-Lower Pliocene) and one *cf. Pleurolestodon* (5.8-5.9 Ma) from the Maimará formation, Maimará locality, Jujuy, Argentina [14].

# Polydolopimorphia

*Chulpasia sp.* (coll. nb. 132938, [43]) was removed as only one record of *Chulpasia* (species *mattaueri*) has been found in Peru.  
*Groeberia minoprioi* (coll. nb. 92669, [44]) age range was set to Late Eocene-Early Oligocene (27.82-37.71 Ma).  
*Marmosopsis sp.* (coll. nb. 133039, [45]) age range was set to Late Palaeocene-Early Eocene (47.8-59.2 Ma).  
*Patagonia peregrina* (coll. nb. 27311, [23]) age range was set to Chattian (23.03-27.82 Ma). All occurrences of *Polydolops clavulus* were renamed *Archaeodolops clavulus*, according to [46]. 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, [47]) was re-assigned to Late Palaeocene (oldest recorded Polydolopid).  
*Polydolops sp.* (coll. nb. 14208, [48]) 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* [21].

# Primates

Ages of Deseadian Soriacebines *Branisella* and *Canaanimico* were restricted to the 24.5-26 Ma interval according to [49].

# Proboscidea

*Mastotherium hyodon* (coll. nb. 142016, [26] and 145181, [50]) genus named was set to *Cuvieronius*.  
*Stegomastodon sp.* (coll. nb. 211646, [51]) was synonymised with *Notiomastodon platensis*.  
All mentions of *Mammut* were removed. *Notiomastodon platensis* (coll. nb. 144515, [52]), formerly described as *Amahuacatherium peruvianum* was removed as its age was questioned in [53].

# Rodentia

## Added Occurrences

*Ricardomys longidens*, Laventan age, San Martín department, Peru [54].  
*Microscleromys sp.* (two occurrences), *Microscleromys cribriphilus*, *Microscleromys paradoxalis*, *Microsteiromys jacobsi*, *Nuyuyomys chinqaska*, *Scleromys*, Laventan age, San Martín department, Peru [54].  
*Balsayacuy sp.*, Rupelian age (restricted to the 27.82-31.1 Ma interval), Departamento de Ucayali, Santa Rosa locality, Peru [55]. 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 [56].  
*Eoincamys valverdei* and *Tarapotomys subandinus*, Early Oligocene of resp. TAR-72 and TAR-22, San Martín, Peru [57].  
*?Palaeocavia* (5.8-5.9 Ma), *Pithanotomys? solisae* (5.8-5.9 Ma), *Pithanotomys sp.* (5.8-5.9 Ma) *Palaeocavia sp.* (5.9-6.0 Ma) and *Palaeocavia humahuaquense* (6.4-6.6 Ma) from the Maimará formation, Maimará locality, Jujuy, Argentina [14].

## Corrections

*Cachiyacuy contamanensis* (coll. nb. 149523, [58]) 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, [59]) were set to Priabonian (33.9-37.2 Ma). Same for *Cachiyacuy cf. kummeli*, *Eoespina* and *cf. Eoespina* (coll. nb. 207062, 207062 and 207065, [59]) Remaning occurrences of the genus *Cachiyacuy* (four in total) were set to Late Eocene (33.9-41.2 Ma).  
*Canaanimys maquiensis* (coll. nb. 149523, [58]) was renamed *Canaanimys sp.* as taxonomic assignation under debate.

Time boundaries of four *Cachiyacuy kummeli* occurrences (coll. nb. 144474, [60]; 176136, [61], 207067 and 207062 [59]) were set to Bartonian-Priabonian (33.9-41.2 Ma). Same for *Eobranisamys sp.* (coll. nb. 176151, [61]) and for all occurrences from the 144474 collection, including one *Chachapoyamys cf. kathetos* [54], one *Eoespina sp.* [60], one *Canaanimys maquiensis* [60] and one *Eobranisamys javierpardoi* [61].  
Ages of all occurrences from the collection 149523 were restricted to Rupelian. These included two *cf. Cachiyacuy kummeli* occurrences [58], one *Canaanimys sp.* [58], 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* [62], one *Pozomys sp.*, two *Pozomys ucayalensis* [58], one *Eodelphomys almeidacomposi*, one *Eopululo wigmorei* [62].  
Ages of two *Sallamys pascuali* occurrences (coll. nb. 95688, [63]; 133539, [64]), three *Branisamys luribayensis* (coll. nb. 95688 [63]; 95688 [65]; 133539 [64]) were sharpened to the 25-26 Ma interval.  
Ages of one *Pozomys ucayalensis* (coll. nb. 176129, [61]) were set to Bartonian-Priabonian (33.9-41.2 Ma). Ages of two *Eoespina sp.* occurrences (coll. nb. 176140, [61]) was restricted to Late Eocene.  
Ages of one *Eoespina* and one *cf. Eoespina* occurrence (coll. nb. 207062 and 207065, [59]) were set to Rupelian.  
*Eoincamys pascuali* (coll. nb. 207064, [59]) 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, [21]) species name was set to *Eopululo sp.* according to [54].  
Names of all *Eumysops chapalmalensis* occurrences were set to *Eumysops chapadmalensis*.

## Removed occurrences

*Cachiyacuy kummeli* (coll. nb. 207067, [59]), renamed *C. cf. kummeli* (doublon) according to [54].  
*Canaanimys sp.* (coll. nb. 176136, [66]), taxonomic revision [54].  
*Canaanimys maquiensis* (two occurrences, coll. nb. 207066 and 207067, [59]), taxonomic revision [54].  
*Chachapoyamys kathetos* (coll. nb. 207067, [54]), re-assigned to *C. cf. kathetos* (doublon) [54].  
Four Brazilian occurrences of the genera *Eobranisamys* (two) and *Eoincamys* (two) with absurd ages (coll. nb. 57989, [67]; coll. nb. 217834, [68]).  
*Tarapotomys sp.* (2 occurrences) (coll. nb. 199560, [57]; coll. nb. 199563, [21]), respectively re-described as *aff. Tarapotomys sp.* and *Tarapotomys subandinus* in [54].  
*Incamys bolivianus* (coll. nb. 95688, [63]), doulon.  
*Asteromys bolivianus* (coll. nb. 133591, [69]), doublon.  
All *Rattus rattus* occurrences, as introduced by humans.

# Sparassodonta

Cleaning was highly based on Tarquini et al. 2022 [70]. In addition, we removed our single *Argyrolestes peralestinus* occurrence (coll. nb. 176285, [71]) as nomen nubidum [72]

# Xenungulata

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