Data Collection on Intergeneric Hybrids and Basic Types: **MAMMALIA**

mammals = Säugetiere

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15.10.2025

Studiengemeinschaft Wort und Wissen
https://www.wort-und-wissen.org/artikel/data-collection-basic-types/

CLASS MAMMALIA
27 orders, 161 families, 1250: 6600

Systematics after en.wikipedia 2025, arranged by orders

ca. 135 intergeneric hybrids in total

31 preliminary basic types (families or subfamilies) as to extant taxa (average 10: 35)

Balaenopteridae 3: 10
Bovidae Alcelaphinae 4: 6
Bovidae Bovinae Bovini 5: 23
Bovidae Caprinae 14: 37
Camelidae 2: 7
Canidae 12: 34
Castoridae 1: 2
Cercopithecidae Cercopithecinae 13: 79
Cercopithecidae Colobinae Presbytini 7: 45
Cervidae 20: 69
Dasypodidae 1: 8
Delphinidae 18: 40
Elephantidae 2: 3
Equidae 1: 8
Felidae 14: 38
Giraffidae 2: 2
Hippopotamidae 2: 2
Hominidae *Homo* 1: 1
Hylobatidae 4: 15
Macropodidae Macropodinae 10: 67
Manidae 3: 8
Monodontidae 2: 2
Muridae Murinae 140: 519
Orycteropodidae 1: 1
Otariidae 7: 16
Phocidae Phocinae 5: 10
Phocoenidae 3: 7
Suidae Suinae 6: 18
Tapiridae 1: 4
Tayassuidae 3: 3
Ursidae Ursinae + Tremarctinae 5: 8

Abbreviations:
° = taxa actually not accepted in the rank of a genus, e. g. *Cerasus*° (= *Prunus* p. p.)
10: 50 etc. The numbers behind the names of families etc. refer to extant genera and species
IS = interspecific hybrid. **IG** = intergeneric hybrid. **IST** = intersubtribal hybrid.
IT = intertribal hybrid. **ISF** = intersubfamilial hybrid. **IF** = interfamilial hybrid
EC = embryo culture or ovule culture
SO = somatic hybrid by cell fusion; normally these hybrids are asymmetric
AS = asymmetric hybrids, they do not equally express maternal and paternal features
HY = assumed intergeneric hybridogeneous origin of a taxon
nat. hyb. = natural hybrid **art. hyb.** = artificial hybrid

Colours within the crosses:
Red letters: intergeneric hybrids (incl. former IG).
Gray letters: hybridity unconfirmed or erroneous.
Green letters: notes on tribes, subfamilies etc. involved in the hybridization.

Yellow shaded: Notes concerning basic types.

General references on mammalian hybrids:

Ackerman K (1898) Thierbastarde. Zusammenstellung der bisherigen Beobachtungen über Bastardierung im Thierreiche nebst Literaturhinweisen. II. Theil: Die Wirbelthiere. Kassel: Weber und Weidemeyer.

Antonius O (1951) Über Artbastarde bei Säugetieren. Verh. Zool.-Bot. Ges. Wien 92, 106–115.

Gray AP (1972) Mammalian hybrids. A check-list with bibliography. Second edition. Commonwealth Agriculturale Bureaux, Slough, England. Edinburgh. Often cited, but unfortunately not very critical

Hartwell S see "Messybeast"

McCarthy EM (2015) Mammalian Hybrids. www.macroevolution.net/mammalian-hybrids.html With much valuable information, but unfortunately not all data are critically evaluated or even sometimes a kind of fake.

McCarthy EM (2018) Mammalian Hybridization – Bibliography. A list of works relevant to mammalian hybridization. Preprint Research Gate. doi: 10.13140/RG.2.2.16039.60326 2300 references on mammalian hybrids, without critical remarks!

"Messybeast" http://www.messybeast.com/genetics/hybrid-cats.htm Information on hybrids of mainly felids, but also bears, bovines, marsupials etc., compiled by Sarah Hartwell

Lightner J (2012) Mammalian Ark Kinds. Answers Research Journal 5, 151–204. https://answersresearchjournal.org/mammalian-ark-kinds/.

Shurtliff QR (2011) Mammalian hybrid zones: a review. Mammals Review 43, 1–21.

https://doi.org/10.1111/j.1365-2907.2011.00205.x Interspecific hybrids
Simpson GG (1945) The principles of classification and a classification of mammals. Bull. Amer. Mus. Nat. Hist. 85, 1–350.
Simpson GG (1961) Principles of animal taxonomy. New York: Columbia Univ. Press.
Van Gelder RG (1977) Mammalian hybrids and generic limits. New York: American Museum Novitates 2635, 1–25. Data on intergeneric hybrids are mainly based on Gray 1972, and therefore some of them are unreliable!
Wilson AC, Maxson LR & Sarich VM (1974) Two types of molecular evolution: evidence from studies of interspecific hybridization. Proc. Natl. Acad. Sci. USA 71, 2843–2847. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC388568/pdf/pnas00060-0257.pdf
Zoochat https://www.zoochat.com/community/search/9707769/?q=hybrid&o=relevance Interesting website with many photos of zoo animal hybrids.

Artiodactyla 4 suborders, 10 families, 85: 270 + many extinct families

even-toed ungulates = Paarhufer

4 suborders:
Ancodonta 1 family Hippopotamidae 1: 2
Ruminantia 6 families: Antilocapridae 1: 1, Bovidae 50: 140, Cervidae 20: 69, Giraffidae 2: 2, Moschidae 1: 7, Tragulidae 3: 10
Suida 2 families Suidae 2: 17, Tayassuidae 3: 3
Tylopoda 1 family Camelidae 2: 7

Artiodactyla: Bovidae 50: 140 + 300 extinct species (suborder Ruminantia)

bovids = Rinder, Hornträger

10 subfamilies:
Aepycerotinae 1: 1 *Aepyceros melampus*
Alcelaphinae 4: 6 *Alcelaphus, Beatragus, Connochaetes, Damaliscus*
Antilopinae 15: 37 *Ammodorcas, Antidorcas, Antilope, Dorcatragus, Eudorcas, Gazella, Litocranius, Madoqua, Nanger, Neotragus, Oreotragus, Ourebia, Procarpa, Raphicerus, Saiga*
Bovinae 12: 35 *Bison, Bos, Boselaphus, Bubalus, Pseudoryx, Syncerus, Taurotragus, Tetracerus, Tragelaphus, …*
Caprinae 14: 37 *Ammotragus, Arabitragus, Budorcas, Capra, Capricornis, Hemitragus, Nemorhaedus, Nilgiritragus, Oreamnus, Ovibos, Ovis, Pantholops* (formerly tribe *Pantholopinae*), *Pseudois, Rupicapra*

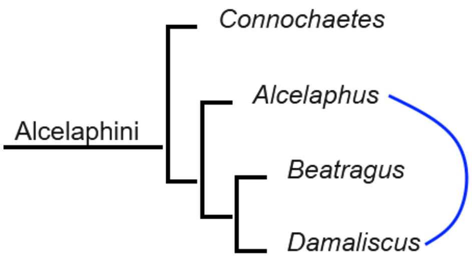
<u>Cephalophinae</u> 3: 20 *Cephalophus, Philantomba, Sylvicapra*
<u>Hippotraginae</u> 3: 8 *Addax, Hippotragus, Oryx*
<u>Nesotraginae</u> 1 *Nesotragus*
<u>Oreotraginae</u> 1 *Oreotragus*
<u>Pantholopinae</u> 1 *Pantholops*
<u>Reduncinae</u> 3: 9 *Kobus, Pelea, Redunca*

Alcelaphinae 4: 6 + many extinct taxa

wildebeest and relatives = Kuhantilopen

Alcelaphus 1, Beatragus 1, Connochaetes 2, Damaliscus 2

Possibly **basic type family Bovidae subfamily Alcelaphinae** (4: 6).



Bovidae subfamily Alcelaphinae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Zurano JP et al. (2019) ("Alcelaphini" sensu Alcelaphinae as listed above). https://doi.org/10.1016/j.ympev.2018.12.015).

Alcelaphus buselaphus × *Damaliscus pygargus* (= "*Dorcas*"), *lunatus* (viable; presumed) Gray 1972, Van Gelder 1977, McCarthy 2015 (nat. hyb.), Van Wyk et al. 2024 (sterile)

Alcelaphus buselaphus × *Alcelaphus* (= *Sigmoceros*°) *lichtensteinii* **IS inter(sub)specific** (nat. hyb.) McCarthy 2015 (capt. hyb., nat. hyb.)

Connochaetes gnou × *Gorgon*° (= *Connochaetes*) *taurinus* **IS** Gray 1972, Van Gelder 1977, McCarthy 2015 (capt. hyb., nat. hyb.)

Antilopinae 14: 38 + extinct genera

gazelles and relatives = Gazellenartige

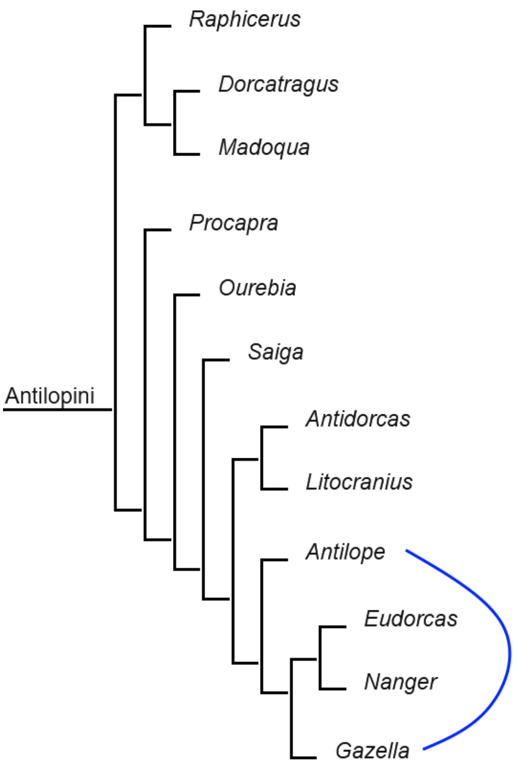
Attention: "*Antilope*" is a genus within tribe Antilopinae, and must not be confused with the word "Antilope" which means members of various Bovidae tribes.

3 tribes:
<u>Antilopini</u> 8: 27 *Ammodorcas 1, Antidorcas 1, Antilope 1 cervicapra, Eudorcas 5, Gazella 12, Litocranius 1, Nanger 3, Procapra 3.*
<u>Neotragini</u> 5: 10 *Dorcatragus 1, Madoqua 4, Neotragus 1, Ourebia 1, Raphicerus 3.*
<u>Saigini</u> 1: 1 *Saiga 1*

In **Bovidae subfamily Antilopinae** at least 4 genera and 19 species (cf. en.wikipedia

2025) belong to the same basic type via *Antilope* × *Gazella*, see the figure below.

Antilope cervicapra × *Gazella dorcas* Antilopini
http://scienceblogs.com/tetrapodzoology/2009/03/408_post-1993_mammal_species.php, McCarthy 2015 (capt. hyb.; *A. cervicapra* × *G. dorcas*, *subguttorosa*, *thomsonii*)
Eudorcas × *Nanger* Antilopini
http://scienceblogs.com/tetrapodzoology/2009/03/408_post-1993_mammal_species.php **undocumented**



Bovidae subfamily Antilopinae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Zurano JP et al. 2019 ("Antilopini" here sensu Antilopinae as listed above). https://doi.org/10.1016/j.ympev.2018.12.015; see also: Bärmann EV 2014 Fig. 1. https://epub.ub.uni-muenchen.de/22395/).

Bovinae 12: 35 + extinct taxa

cattle, bisons etc. = Rinderartige
3 tribes:
Bovini 5: 23 *Bison 6*, *Bos* (incl. *Bibos°*, *Poephagus*) *10*, *Bubalus 5*, *Pseudoryx 1*, *Syncerus 1*
Boselaphini 2: 2 *Boselaphus 1*, *Tetracerus 1*
Tragelaphini 5: 10 *Taurotragus 2* (*derbianus*, *oryx*), *Tragelaphus 8* (incl. *Ammelaphus°*, *Boocercus°*, *Nyala°*, *Strepsiceros°*)

In **family Bovidae subfamily Bovinae** probably at least the members of **subtribe Bovina** belong to the same basic type, containing the genus *Bos* with subgenera (incl. *Bison* and *Bibos*) with at least 16 extant and 19 extinct species (cf. de.wikipedia 2025.

https://en.wikipedia.org/wiki/Bovina_(subtribe)#The_Fossil_Record). According to the cladogram below (Martínez-Navarro et al. 2007, Fig. 4) the fossil genera *Leptobos* and *Pelorovis* (7+5 species) are included. There are at least 6 additional fossil species of different genera in Bovina. Consequently, 53 or more species belong to this basic type, especially if fossil taxa are included.
Probably at least **tribe Tragelaphini** forms another basic type.

Bibos° (= *Bos* p. p.) × *Bos* **IS** Bovini Van Gelder 1977. The hybridization was one of the reasons to unite the formerly distinct genera!

Bison bison, bonasus × *Bos taurus* Bovini (→ "Beefalo", "Zubron") Gray 1972, Van Gelder 1977, Vasil'ev 2002 a, b, McCarthy 2015 (capt. hyb., *Bison bison* × *Bos frontalis, taurus, grunniens; Bison bonasus* × *Bos taurus*)

Bison bison × *Bubalus* Gray 1972 ("unsuccessful"), Owiny et al. 2009 ("not authenticated")

Bison bison × *Syncerus caffer* Bovini Owiny et al. 2009 (only up to the morula or blastula stage)

Bos taurus × *Bubalus bubalis* Bovini Gray 1972 (mating occurs, but no progeny or only doubtful reports), Kochhar et al. 2002, Patil &Totey 2003 (i
n laboratory experiments, the embryos fail around the 8-cell stage)

~~*Bos × Capra*~~ **ISF** Bovinae × Caprinae **erroneous**, see Mohr 1930

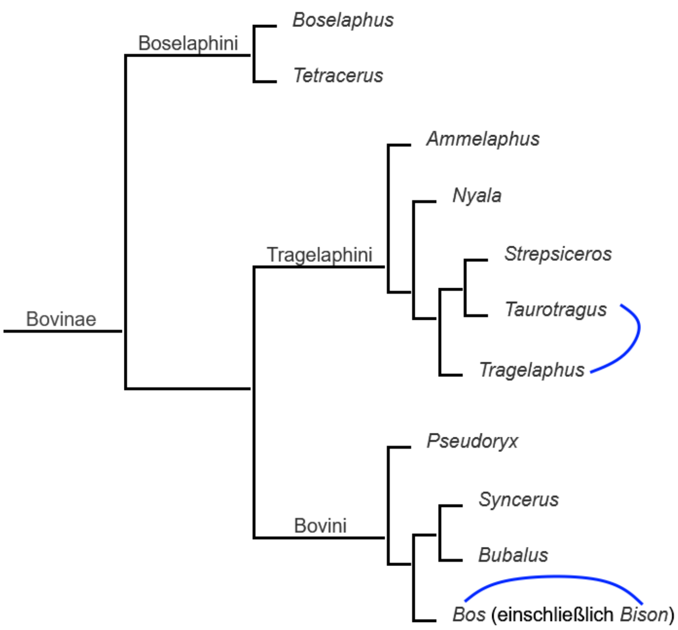
Bos taurus × *Ovis aries* **ISF** Bovinae × Caprinae **questionable**, see McCarthy 2015 (capt. hyb.)

Bos taurus × *Poephagus*° (= *Bos*) *grunniens* = *mutus* **IS** Bovini (→ "Dzo") Petzsch 1957 a, Gray 1972 (viable), Van Gelder 1977, http://en.wikipedia.org/wiki/Dzo 2008 (cattle × yak), McCarthy 2015 (capt. hyb.)

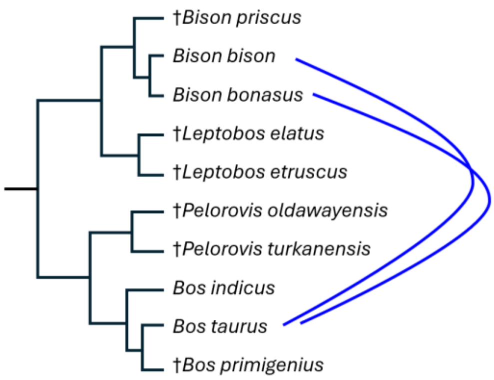
Bos taurus × *Taurotragus oryx* **IT** Bovini × Tragelaphini (capt. hyb.) McCarthy 2015, **not well documented**

Taurotragus oryx × *Tragelaphus strepsiceros* Tragelaphini Gray 1972 (presumed), Jorge et al. 1976, Van Gelder 1977, http://www.messybeast.com/genetics/hybrid-deer-antelope.htm 20252, McCarthy 2015 (capt. hyb.)

Tragelaphus (= *Boocercus*°) *eurycerus* × *Tragelaphus spekei* **IS** Tragelaphini Gray 1972 (capt. hyb., viable), McCarthy 2015



Bovidae subfamily Bovinae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Zurano JP et al. 2019. https://doi.org/10.1016/j.ympev.2018.12.015).



Bovidae subfamily Bovinae tribe Bovini subtribe Bovina: Hybridization within the phylogeny according to Martínez-Navarro et al. (2007, Fig. 4. doi:10.1016/j.yqres.2007.06.002) including extinct species.

Caprinae 14: 37

sheep and goats = Böcke

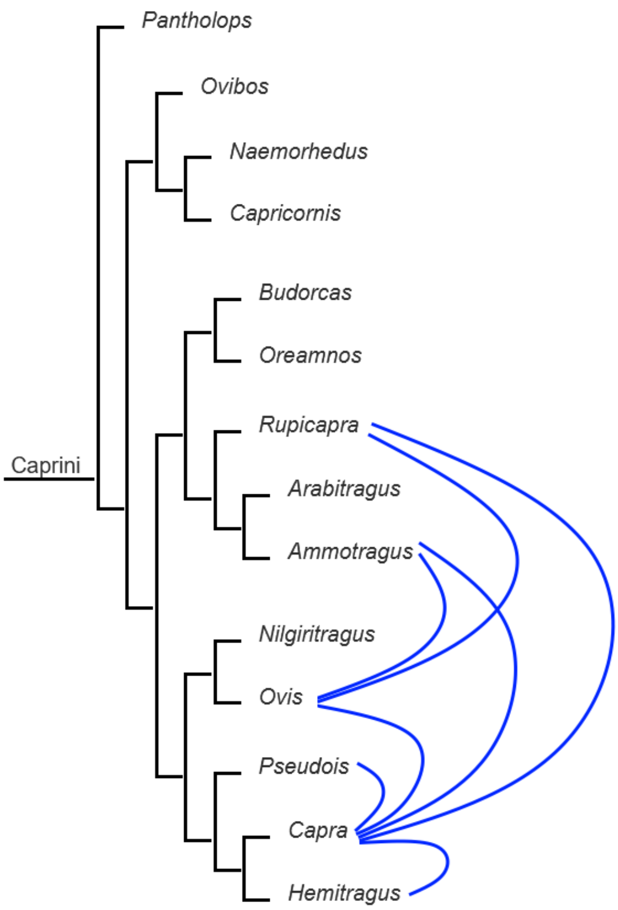
3 tribes:

Caprini 10: 25 *Ammotragus 1, Arabitragus 1, Budorcas 1, Capra 10, Hemitragus 1, Nilgiritragus 1, Oreamnus 1, Ovis 7, Pseudois 1, Rupicapra 1*

Pantholopini 1: 1 *Pantholops 1*

Ovibonini 3: 11 *Capricornis 6, Nemorhaedus 4, Ovibos 1*

Probably **basic type family Bovidae subfamily Caprinae** (14: 37): Klöckner 1998 (unpubl., Fachtagung Biologie Wort und Wissen). 6 of the 10 genera are linked in tribe Caprini (10: 25) by hybridization such that all genera belong to the same basic type if compared with the molecular data of Zurano et al. 2019. – No intergeneric hybrids are known as yet within or with the 2 other tribes, but all genera have much in common anatomically.



Bovidae subfamily Caprinae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Zurano JP et al. 2019 ("Caprini" here sensu "Caprinae" as listed above). https://doi.org/10.1016/j.ympev.2018.12.015)

Ammotragus lervia × *Capra hircus* Caprini Petzsch 1957b, Gray 1972 (viable), Moore et al. 1981, Klöckner 1998 (often only fetuses), McCarthy 2015 (capt. hyb.)

Ammotragus lervia × *Ovis aries* Caprini Gray 1972 (unsuccessful), Moore et al. 1981, Klöckner 1998 (often only fetuses), McCarthy 2015 (art. hyb., fertile embryos, but none developed)

Capra: Ropiquet & Hassanin 2006 suggest a hybridogeneous origin of the Pliocene ancestor of goats (*Capra*) **HY**

Capra hircus × *Hemitragus* Caprini Gray 1972 (abortions), Klöckner 1998 (often only fetuses)

Capra hircus × *Ovis aries* Caprini Gray 1972 (capt. hyb.; questioned), Brunner 1988 Klöckner 1998 (often only fetuses), McCarthy 2015 (capt. hyb.), Pauciullo et al. 2016

Capra aegagrus × *Pseudois nayaur* Caprini McCarthy 2015 (capt. hyb.)

Capra hircus × *Rupicapra rupicapra* Caprini Gray 1972 (capt. hyb., doubtful), McCarthy 2015 (nat. hyb.)

Ovis × *Rupicapra* Caprini Gray 1972 (hybrid embryos died), Klöckner 1998 (often only fetuses)
Ovis ammon × *Ovis aries* DOI:10.15389/agrobiology.2020.6.1139eng

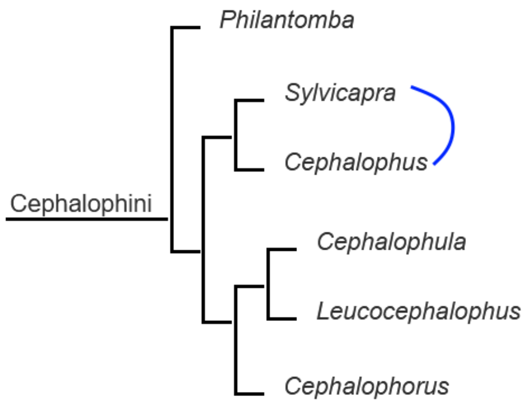
Cephalophinae 3: 22 + extinct taxa

duikers = Ducker

Cephalophus 18 (incl. *Cephalophula 1 zebra, Leucocephalophus 1 adersi*), *Philantomba 3, Sylvicapra 1*

For interspecific hybrids see http://messybeast.com/genetics/hybrid-deer-antelope.htm 2025

Cephalophus natalensis× *Sylvicapra grimmia* Bigalke 1932, Gray 1972 (some viable, capt. hyb.), http://messybeast.com/genetics/hybrid-deer-antelope.htm 2025



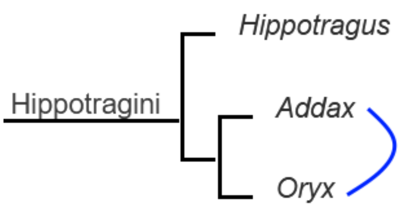
Bovidae subfamily Cephalophinae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Zurano JP et al. 2019. https://doi.org/10.1016/j.ympev.2018.12.015)

Hippotraginae 3: 8

antelopes p. p.= Antilopen z. T., Pferdeböcke

Addax 1, Hippotragus 1, Oryx 6.

For interspecific hybrids see http://messybeast.com/genetics/hybrid-deer-antelope.htm 2025



Bovidae subfamily Hippotraginae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Zurano JP et al. 2019. https://doi.org/10.1016/j.ympev.2018.12.015)

Addax nasomaculatus × *Oryx dammah* http://messybeast.com/genetics/hybrid-deer-antelope.htm 2025

Addax nasomaculatus × *Oryx gazella* ("Gemsbock") **unconfirmed, but possible** https://www.flickr.com/photos/trebaruna/albums/72157719435107859/

Reduncinae 3: 10

Antelopes p. p. = Ried- und Wasserböcke

Kobus 6 (incl. *Adenota°*, *Onotragus°*), *Pelea*, *Redunca*

Adenota° (= *Kobus* p. p.) × *Kobus* **IS** Van Gelder 1977 (fertile)

Adenota° (= *Kobus* p. p.) × *Kobus* × *Onotragus°* (= *Kobus*) leche **IS** Van Gelder 1977

Kobus × *Onotragus°* (= *Kobus* p. p.) **IS** Van Gelder 1977

References:

Bigalke R (1932) On a hybrid duiker (*Cephalophus natalensis* × *Sylvicapra grimmia*). Report of the Director of Veterinary Services and Animal Industry, Pretoria, 18, 1093–1094.

Brunner RM (1988) Vergleichende Studien an Chromosomen von Schaf, Ziege und einem Schaf-Ziege-Bastard unter Einbeziehung einer computergestützten Karyotopanalyse. Microreproduction: 3 Microfiches. Dissertation Univ. Rostock.

en.wikipedia.org/wiki/Bovid_hybrid. useful information

Jorge W, Butler S & Benirschke K (1976) Studies on a male eland × kudu hybrid. J. Reproduction and Fertility 46, 13–16. *Taurotragus* × *Tragelaphus*.

Klöckner P (1998, unpubl.) Caprinae = Böcke – ein Grundtyp. Fachtagung Biologie Wort und Wissen.

Kochhar HPS et al. (2002) In vitro production of cattle-water buffalo (*Bos taurus* - *Bubalus bubalis*) hybrid embryos. Zygote 10 (2), 155–162.

Lightner JK (2006) Identification of species within the sheep-goat kind (Tsoan monobaramin). Journal of Creation 20 (3), 61–65. Caprinae

Lightner JK (2007) Identification of species within the cattle monobaramin (kind). Journal of Creation 21, 119–122. Bovinae

Mohr E (1930) Der angebliche Schaf-Rind-Bastard („Schafochse") von Husum. Zool. Garten (Leipzig) 3 (1/3), 35–39. History and description of the animal, evidently not a hybrid, but an under-sized bull

Moore NW et al. (1981) Studies on hybridisation between Barbary ram (*Ammotragus lervia*) and domestic ewes (*Ovis aries*) and Nanny goats (*Capra hircus*). J. Reproduction and Fertility 61, 79–82.

Owiny OD et al. (2009) In vitro production of cattle × buffalo hybrid embryos using cattle oocytes and African buffalo (*Syncerus caffer caffer*) epididymal sperm. Theriogenology 71, 884–894. *Bison bison* × *Syncerus caffer,* only up to the blastula stage

Patil S & Totey S (2003) Developmental failure of hybrid embryos generated by in vitro fertilization of water buffalo (*Bubalus bubalis*) oocyte with bovine

spermatozoa. Molecular Reproduction and Development 64, 360–368. doi:10.1002/mrd.10269
Pauciullo A et al. (2016) Characterization of a very rare case of living ewe-buck hybrid using classical and molecular cytogenetics. Nature. Scientific reports. https://www.nature.com/articles/srep34781 *Ovis aries* ♀ × *Capra hircus* ♂.
Petzsch H (1957a) Ein bemerkenswerter Bastard ♂ aus Hausyak ♂ × Hausrind ♀. Säugetierkundl. Mitt. 1957, 76–77. *Bison* × *Bos.*
Petzsch H (1957b) Lebender ♀ Bastard aus *Ammotragus lervia* Pall. × *Capra hircus* L. ♀ im Berg-Zoo Halle-S. geboren. Zool. Anz. 1957, 285–290.
Ropiquet A & Hassanin A (2006) Hybrid origin of the Pliocene ancestor of wild goats. Mol. Phylogen. Evol. 41 (2), 395–404.
Takeda K et al. (2012) Influence of intergeneric/interspecies mitochondrial injection; parthenogenetic development of Bovine oocytes after injection of mitochondria derived from somatic cells. J. Reprod. Development 58 (3), 323–329.
Van Wyk AM et al. (2024) Hybridization in an isolated population of blesbok and red hartebeest. Ecol. Evol. 14 (4):e11194. doi: 10.1002/ece3.11194 *Alcephalus* × *Damaliscus*
Vasil'ev VA, Steklenev EP & Morozova EV (2002a) DNA fingerprinting of individual species and intergeneric and interspecific hybrids of the genera *Bos* and *Bison*, subfamily Bovinae. Genetika 38, 515–520.
Vasil'ev VA, Steklenev EP, Morozova EV & Semyenova SK (2002b) DNA fingerprinting of individual species and intergeneric and interspecific hybrids of the genera *Bos* and *Bison*, subfamily Bovinae. Russian J. Genetics 38 (4), 415–420.

Artiodactyla: Camelidae 2: 7 + extinct taxa (suborder Tylopoda)

camels = Kamelartige

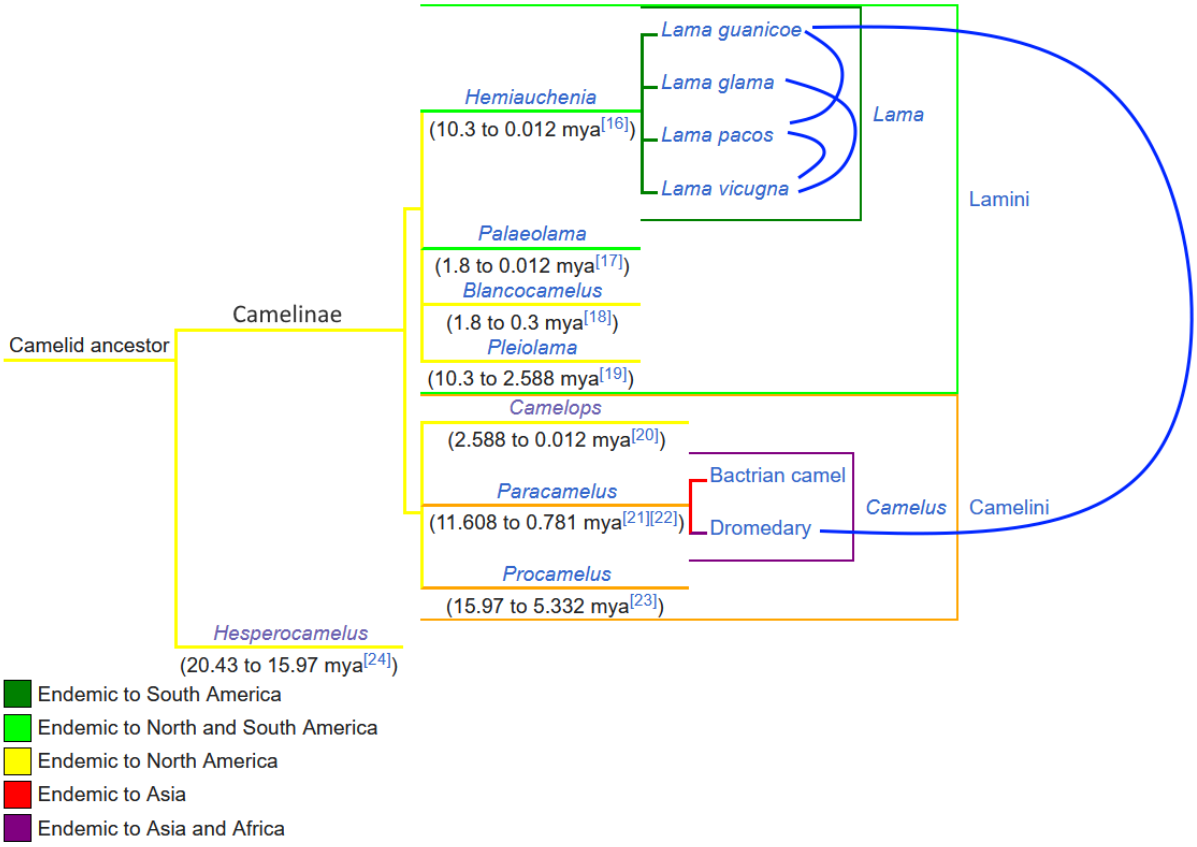
1 extant subfamily Camelinae with 2 tribes:
Camelini 1: 3 *Camelus bactrianus, dromedarius, ferus, Lama 4* (incl. *Vicugna* 2)
Lamini 1: 4 *Lama glama, guanicoe, pacos* (= *Vicugna*° *pacos*), *vicugna* (= *Vicugna*° *vicugna*)

Basic type family Camelidae (2: 7): Junker 2000, at least for the extant genera. The two extant genera are connected by hybridization. Probably all fossil members of subfamily Camelinae are also included in this basic type (see below and cf. Heintzman et al. (2015. doi:10.1093/molbev/msv128): 2 extant and 6 extinct genera with 7 extant and at least 22 extinct species (cf. en.wikipedia 2025); cf. Lynch S et al. (2020, Fig. 12. https://doi.org/10.1186/s13358-020-00208-6): all fossil Camelinae included except *Alforjay taylori*.

Camelus dromedarius × *Lama guanicoe* **IT** Camelini × Lamini Skidmore et al. 1999, McCarthy 2015, called "Cama"

Lama glama × *Vicugna*° (= *Lama*) *pacos, vicugna* **IS** Lamini (→ http://en.wikipedia.org/wiki/Huarizo, McCarthy 2015, called „Huarizo" (male llama and a female alpaca) or „Alpama"

Lama guanicoe × *Vicugna*° (= *Lama*) *pacos* **IS** Lamini Gray 1972 (art. hyb., viable), McCarthy 2015



Camelidae subfamily Camelinae: Hybridization within the phylogeny according to en.wikipedia 2025, CC BY 4.0 https://en.wikipedia.org/w/index.php?title=Camelidae&oldid=1299394541

References:

Heintzman PD et al. (2015) Genomic data from extinct North American *Camelops* revise Camel evolutionary history. Mol. Biol. Evol. 32, 2433–2440. doi:10.1093/molbev/msv128.

Junker R (2000) Mischling aus Dromedar und Lama – die Cameliden: ein Grundtyp. Stud. Integrale J. 7, 41–42.

Lynch S et al. (2020) Description of a fossil camelid from the Pleistocene of Argentina, and a cladistic analysis of the Camelinae. Swiss J. Palaeontol. 139, 8, https://doi.org/10.1186/s13358-020-00208-6.

Skidmore JA, Billah M, Binns M, Short RV & Allen WR (1999) Hybridizing old and new world camelids; *Camelus dromedarius* × *Lama guanicoe*. Proc. R. Soc. London B 266, 649–656.

Wood TC, Williams PJ, Wise KP & Robinson DA (1999) Baraminology of the Camelidae. pp. 9–18 in Robinson DA & Williams PJ (eds). Baraminology '99. Baraminology Study Group.

Artiodactyla: Cervidae 20: 69 + many extinct taxa (suborder Ruminantia)

deer = Hirschartige

2 subfamilies:

Capreolinae 11: 40 *Alces 1, Blastocerus 1, Capreolus 2, Hippocamelus 2, Hydropotes 1, Mazama 23, Odocoileus 3, Ozotoceros 1, Pudella 2, Pudu 1, Rangifer 1*

Cervinae 9: 29 *Axis 4* (incl. *Hyelaphus° porcinus*), *Cervus 5, Dama 2, Elaphodus 1, Elaphurus 1, Muntiacus 12, Rucervus 2 duvaucelii, eldii* (= *Panolia eldii*), *Rusa 4*.

Probably **basic type family Cervidae** (20: 69), at least for the extant species: The two subfamilies are connected by three hybrid combinations. It seems worthwhile to examine the fossil deer as well, cf. https://en.wikipedia.org/wiki/Category:Prehistoric_deer.

Alces alces × *Cervus* (*elaphus*) *canadensis* Capreolinae × Cervinae **ISF** Gray 1972 (presumed), McCarthy 2015 (questionable, but possible)

Axis axis × *Cervus nippon, elaphus* Cervinae Gray 1972 (viable, fertile), Asher et al. 1999, Lightner 2006, http://www.messybeast.com/genetics/hybrid-deer-antelope.htm 2012, McCarthy 2015

Axis axis × *Cervus* × *Rucervus* Cervinae trigeneric hybrid http://scienceblogs.com/tetrapodzoology/2009/03/408_post-1993_mammal_species.php

Axis axis × *Hemitragus jemlahicus* Cervidae Cervinae × Bovidae Caprinae **IF** (nat. hyb.) McCarthy 2015 (questionable)

Axis axis × *Hyelaphus°* (= *Axis*) *porcinus* **IS** Cervinae (art. hyb., fertile) Gray 1972, McCarthy 2015 (capt. hyb.)

Axis axis × *Odocoileus virginianus* **ISF** Cervinae × Capreolinae Gray 1972 (viable, art. hyb.), doubted by Van Gelder 1977, see McCarthy 2015

Axis axis × *Rucervus duvaucelii* Cervinae Gray 1972 (art. hyb., viable), McCarthy 2015 (capt. hyb.)

Capreolus pygargus × *Cervus elaphus* **ISF** Capreolinae × Cervinae McCarthy 2015

Capreolus capreolus × *Hyelaphus°* (= *Axis*) *porcinus* **ISF** Capreolinae × Cervinae Gray 1972 (art. hyb., viable), doubted by Van Gelder 1977, McCarthy 2015

Cervus elaphus × *Dama dama* Cervinae Gray 1972 (doubtful)

Cervus canadensis × *Odocoileus hemionus* **ISF** Cervinae × Capreolinae Gray 1972 (capt. hyb., viable), McCarthy 2015 (*C.* × *O. virginianus*)

Cervus elaphus × *Elaphurus davidianus* Cervinae Gray 1972 (viable, fertile), Maqbool et al. 2007, Lightner 2006, McCarthy 2015

Cervus elaphus × *Panolia* (= *Rucervus*) *eldii* → *Elaphurus* Cervinae possibly hybridogeneous origin = **HY** Meijaard & Groves 2004, McCarthy 2015 (citing Pitra et al. 2004)

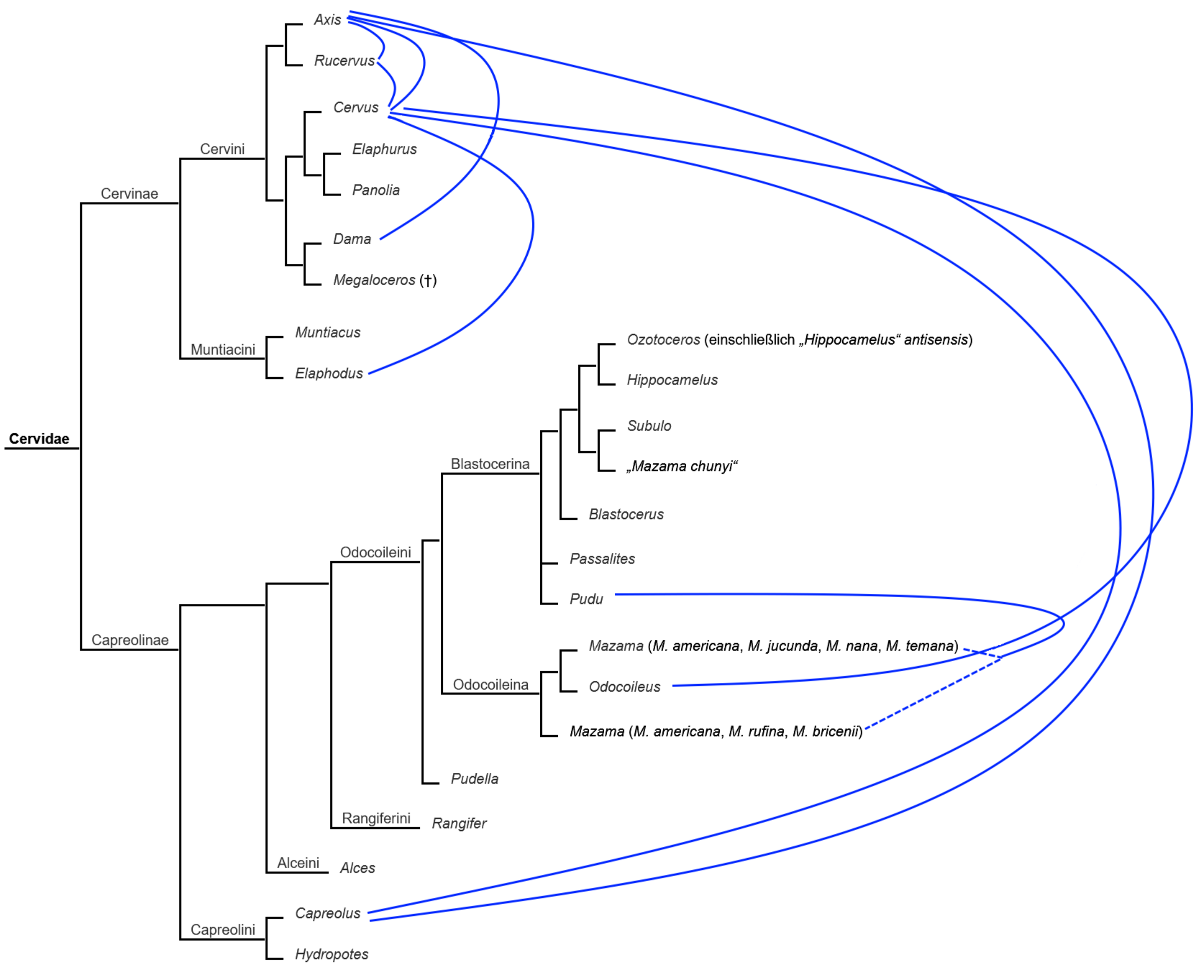
Cervus elaphus × *Rangifer tarandus* **ISF** Cervinae × Capreolinae Gray 1972 (unsuccessful)

Cervus elaphus × *Rusa* (= *Cervus*) *unicolor* Cervinae Mi et al. 2014

Dama dama × *Hyelaphus*° (= *Axis*) *porcinus* Cervinae Gray 1972 (viable), Lightner 2006, McCarthy 2015

Dama dama × *Odocoileus hemionus* **ISF** Cervinae × Capreolinae Gray 1972 (**unsuccessful**)

Mazama americana = *rufa* × *Pudu* (= *Cervus*) *puda* Capreolinae McCarthy 2015



Cervidae: Hybridization within the phylogeny according to en.wikipedia 2025, CC BY 4.0 (cf. Heckeberg NS 2020. doi:10.7717/peerj.8114).

References:

Asher GW, Gallagher DS, Tate ML & Tedford C (1999) Hybridization between sika deer (*Cervus nippon*) and axis deer (*Axis axis*). J. Heredity 90 (1), 236–240.

Lightner JK (2006) The baraminic status of the family Cervidae as determined using interspecific hybrid data. pp. 12–13 in Sanders R (ed.) Proc. Fifth BSG Conf. Occas. Papers BSG Study group.

Maqbool NJ et al. (2007) A QTL study of growth and body shape in the inter-species

hybrid of Pere David's deer (*Elaphurus davidianus*) and red deer (*Cervus elaphus*). Animal Genetics 38 (3), 270–276.
Meijaard E & Groves CP (2004) Morphometrical relationships between South-east Asian deer (Cervidae, tribe Cervini): evolutionary and biogeographic implications. J. Zool. London 263, 179–196.
Mi D et al. (2014) Main hybrid types in the production of deer in China. Special Economic Animal Plant 17, 7–10.
Zurano JP et al. (2019) Cetartiodactyla: Updating a time-calibrated molecular phylogeny. Mol. Phylogen. Evol. 133, 256–262. https://doi.org/10.1016/j.ympev.2018.12.015.

Artiodactyla: Giraffidae 2: 2 + many extinct taxa (suborder Ruminantia)

giraffe + okapi = Giraffen

Giraffa 1, Okapi 1.

Probably **basic type family Giraffidae** (2: 2), at least for the extant taxa: Binder 2017. Well-defined group, the two genera differ genetically from all other mammals. Hybrids are unknown. For extinct taxa see Lönnig 2012.

Okapi as a possible *Giraffa* hybrid **HY** see http://www.macroevolution.net/giraffe-zebra-hybrid.html **uncertain**

Binder H (2017) Giraffenartige – Genom und Körperbau. Studium Integrale J. 24, 40–42.
Lönnig W-E (2012) Die Evolution der Langhalsgiraffe (*Giraffa camelopardalis* L.): Was wissen wir tatsächlich? Testfall für Gradualismus, Makromutationen und intelligentes Design. M-V-Verlag Münster.

Artiodactyla: Hippopotamidae 2: 2 + extinct taxa (suborder Whippomorpha)

hippomotamids = Flusspferde

Hippopotamus amphibius, Choeropsis liberiensis

Probably **basic type family Hippopotamidae** (2: 2) as a well-defined group, though hybrids are unknown.

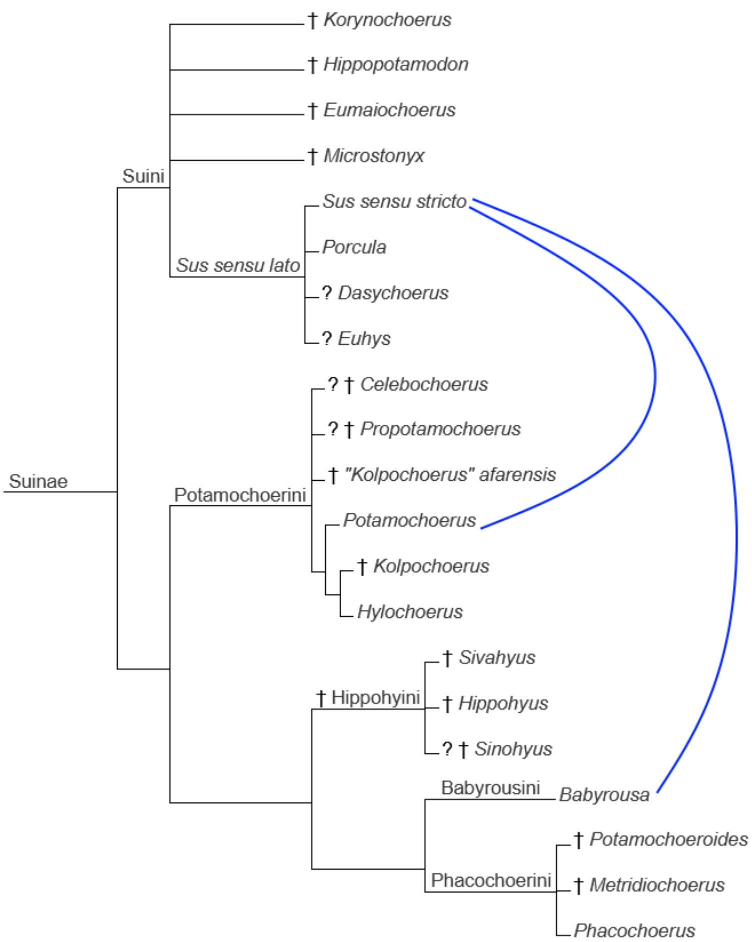
Artiodactyla: Suidae 6: 18 + >30 extinct genera (suborder Suina)

pigs, hogs, swines = Echte Schweine

1 extant subfamily Suinae, 4 tribes (+ 1 extinct tribe):
Suini 2: 9 (+ extinct genera) *Porcula 1, Sus 8*
Babyrousini 1: 4 *Babyrousa 4*
Phacochoerini 1: 2 *Phacochoerus 2*
Potamochoerini 2: 3 (+ extinct genera) *Hylochaerus 1, Potamochoerus 2*

Basic type family Suidae subfamily Suinae: The known hybridizations connect 3 of the 4 extant tribes, thereby not only including all extant tribes (6: 18), but also all extinct genera (ca. 14) of the subfamily.

Babyrousa babyrussa × *Sus scrofa* **IT** Babyrousini × Suini
http://en.wikipedia.org/wiki/North_Sulawesi_babirusa 2012 (capt. hyb., Zoo Copenhagen), McCarthy 2025, messybeast 2025, Thomsen et al. 2011
Potamochoerus porcus, larvatus × *Sus scrofa* **IT** Potamochoerini × Suini McCarthy 2015



Suidae subfamily Suinae: Hybridization within the phylogeny according to en.wikipedia 2025, CC BY 4.0 (cf. Mikko's Phylogeny Archive (based on McKenna & Bell, 1997, Liu 2003, Harris & Liu, 2007) https://www.mv.helsinki.fi/home/mhaaramo/metazoa/deuterostoma/chordata/synapsida/eutheria/artiodactyla/suina/suidae.html

References:

Thomsen PD et al. (2011) Meiotic studies in infertile domestic pig-babirusa hybrids. Cytogenet. Genome Res. 132, 124–128. doi: 10.1159/000320421.

Artiodactyla: Tayassuidae 3: 3 + 14 extinct genera (suborder Suina)

peccaries = Pekaris, Nabelschweine

Catagonus 1 wagneri, Dicotyles 1 tajacu (incl. *Pecari°*), *Tayassu 1 pecari.*

Probably **basic type family Tayassuidae** (3: 3). According to the cladogram of Parisi Dutra (2016, Fig. 1. doi:10.1007/s10914-016-9347-8) at least all extant Tayassuidae, belong to the same basic type but possibly several fossil taxa can be included in this basic type, also.

Dicotyles (= *Pecari°*) *tajacu* × *Tayassu pecari* Gray 1972 (viable, art. hyb.), McCarthy 2015, messybeast 2025

Pecari angulatus × *Sus scrofa* **IF** Tayassuidae × Suidae Gray 1972 (unlikely)

References:

Parisi Dutra R et al. (2016) Phylogenetic systematics of peccaries (Tayassuidae: Artiodactyla) and a classification of South American tayassuids. J. Mammal. Evol. 24, 345–358 https://doi.org/10.1007/s10914-016-9347-8 Phylogeny, monophyletic family!

Carnivora 2 suborders, 17 extant families, 280 species

carnivorans = Raubtiere

2 suborders:

Caniformia 9 extant families: clade Canoidea: Canidae, Ursidae; superfamily Musteloidea: Ailuridae, Mephitidae, Mustelidae, Procyonidae; clade Pinnipedia: Odobentidae, Otariidae, Phocidae → **order Pinnipedia)**

Feliformia 8 families

Carnivora: Canidae 12: 34 + many extinct taxa incl. subfamilies (suborder Caniformia)

canines, dogs = Hunde

The subdivision is still matter of debate

3 tribes:

Canini 8: 18 *Atelocynus 1, Canis* (incl. *Thos*) *6, Cerdocyon 1, Chrysocyon 1, Cuon 1, Lycaon 1, Lycalopex 6, Speothos 1.*

Vulpini 3: 14, *Vulpes* (incl. *Alopex°*) *12, Otocyon 1, Nyctereutes 1*

Urocyonini: 1: 2 *Urocyon 2*

Basic type family Canidae seems probable, at least for the extant taxa (12: 34): Crompton 1993, Pendragon 2011, Scholl 2025. Actual molecular data show the connection of very different clades. Recent crossbreeding and the results of molecular studies, which show that crossbreeding connects subgroups that are far apart, confirm the basic type of canines. However, the classification of the Urocyonini (gray fox clade: 9 extant/extinct species) and Vulpini (red fox clade: 19 extant/extinct species), as well as that of some extinct species, have not yet been definitively clarified, as the data have not yet been confirmed by molecular genetics. At very least 18 extant and 25 extinct species (cf. Zrzavý J et al. 2018. doi.org/10.1111/zsc.12293) of Canini belong to this basic type.

Alopex° (= *Vulpes*) *lagopus* × *Vulpes vulpes* **IS** Vulpini Wipf & Shackelford 1949, Gray 1972 (some offspring are fertile), Zakiyan et al. 1975, Serov et al. 1976, 1977, Van Gelder 1977, Crompton 1993, McCarthy 2015 (capt. hyb.)

Canis × *Cerdocyon* Canini Gray 1972 (*Ca. familiaris* × *Ce. thous*, presumed), Crompton 1993, McCarthy 2015 http://www.macroevolution.net/dog-hybrids.html

Canis × *Cuon alpinus* Canini questioned by Van Gelder 1977 and McCarthy 2015

Canis familiaris × *Lycalopex (= Pseudalopex°) gymnocercus* Canini McCarthy 2015, en.wikipedia 2025, Szynwelski BE et al. (2023. https://doi.org/10.3390/ani13152505; cf. Scholl 2025)

Canis familiaris, latrans × *Thos°* (= *Canis*) *aureus* **IS** Canini Gray 1972, Van Gelder 1977 (fertile), http://en.wikipedia.org/wiki/Jackal%E2%80%93dog_hybrid, McCarthy 2015 (capt. hyb.)

Canis × *Vulpes* **IT** Canini × Vulpini Gray 1972 (presumed), Van Gelder 1977 (*C. latrans* × *V. vulpes* 1975: “seems no doubt”), Crompton 1993, McCarthy 2015 (*C. dingo* × *V. vulpes*: unreliable, *C. familiaris* × *V. vulpes* capt. hyb., *C. lupus* × *V. vulpes* unreliable)

Urocyon cinereoargenteus × *Vulpes vulpes* Vulpini Gray 1972 (uncertain), Crompton 1993, McCarthy 2015

Canidae: Important Hybridizations within the phylogeny according to en.wikipedia 2025, CC BY 4.0 (cf. Lindblad-Toh K et al. 2005. https://doi.org/10.1038/nature04338). Dotted lines = unconfirmed hybrids.

References:
Crompton N (1993) A review of selected features of the family Canidae with reference to its fundamental taxonomic status. pp. 217–224 in Scherer S (ed.) Typen des Lebens: Berlin: Pascal. This paper has originally been written in English, and therefore is not reprinted in „Basic Types of Life" of Sanders (2025).
Pendragon B (2011) A review of selected features of the family Canidae with reference to its fundamental taxonomic status. J. Creat. 25, 79–88. https://creation.com/images/pdfs/tj/j25_3/j25_3_79-88.pdf.
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Serov OL et al. (1976) Allelic expression in intergeneric fox hybrids (*Alopex lagopus* × *Vulpes vulpes*). I. Comparative electrophoretic studies on blood enzymes and proteins in Arctic and Silver foxes. Biochemical Genetics, 14, 1091–1103.
Serov OL & Zakijan SM (1977) Allelic expression in intergeneric fox hybrids (*Alopex lagopus* × *Vulpes vulpes*). II. Erythrocyte glucose-6-phosphate dehydrogenase in Arctic and Silver foxes: Purification and properties. Biochemical Genetics, 15, 137–146.
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Wipf L & Shackelford RM (1949) Chromosomes of a fox hybrid (*Alopex-Vulpes*). Proc. National Acad. Sci. USA 35 (8), 468–472.
Zakiyan SM et al. (1975) Expression of allelic genes in intergeneric fox hybrids (*Alopex lagopus* × *Vulpes vulpes*). 1. Comparative electrophoretic analysis of blood proteins and enzymes in blue and silver foxes. Genetika 11 (8), 40ff.

Carnivora: Felidae 14: 38 + extinct taxa (suborder Feliformia)

felines, wild cats = Katzen

2 subfamilies:
Felinae 12: 31 *Acinonyx 1 jubatus, Caracal 1 caracal, Catopuma 2 badia, temminckii, Felis 6 bieti, catus, chaus, margarita, nigripes, silvestris, Leopardus 9 braccatus, colocolo, geoffroyi, guigna, jacobitus, pajeros, pardalis, tigrinus, wiedii, Leptailurus 1 serval, Lynx 4 canadensis, lynx, pardinus, rufus, Otocolobus 1 manul, Pardofelis marmorata, Prionailurus 5 bengalensis, itiomotensis, planiceps, rubiginosus, viverrinus, Profelis 1 aurata, Puma 2 concolor, yagouaroundi*
Pantherinae 2: 7 *Neofelis 2 nebulosa, diardi, Panthera 4* (incl. *Uncia° uncia*)

Basic type family Felidae (14: 38), at least for extant taxa: Crompton & Winkler 2006, Pendragon & Winkler 2011: The two subfamilies are linked by hybridization.

For detailed information and the species involved see Crompton 2006, http://en.wikipedia.org/wiki/Felid_hybrid and the internet presentation of Sarah Hartwell: www.messybeast.com/, e. g. her critical comments on alleged hybrids: http://www.messybeast.com/small-hybrids/false-hybrids.htm

Caracal caracal × *Felis catus* Felinae Crompton 2006, www.messybeast.com 2012, http://en.wikipedia.org/wiki/Felid_hybrid 2012, McCarthy 2015 (capt. hyb.)

Caracal caracal × *Leptailurus serval* Felinae www.messybeast.com 2012, McCarthy 2015 (capt. hyb.)

Felis × *Leopardus* div. spec. Felinae Crompton 2006, www.messybeast.com 2012, http://en.wikipedia.org/wiki/Felid_hybrid 2012 (attention: *Leopardus* is not the Leopard = *Panthera pardus*!), McCarthy 2015 (capt. hyb., nat. hyb. *F. catus* × *L. geoffroyi; F. catus* × *L. tigrinus; F. catus* × *L. wiedii*)

Felis × *Leptailurus serval* Felinae www.messybeast.com 2012, http://en.wikipedia.org/wiki/Felid_hybrid 2012, McCarthy 2015 (capt. hyb. *F. catus* × *L. serval; F. silvestris* × *L. serval*)

Felis × *Lynx* Felinae Van Gelder 1977, Crompton 2006, McCarthy 2015 (capt. hyb. *F. catus* × *Lynx lynx; F. catus* × *Lynx lynx; F. chaus* × *L. rufus*)

Felis catus × *Otocolobus manul* Felinae Crompton 2006, McCarthy 2015 (capt. hyb.)

Felis × *Panthera* **ISF** Felinae × Pantherinae Gray 1972, McCarthy 2015 The question arises as to whether this is even possible given the difference in size.

Felis × *Prionailurus* (= *Felis*°) Felinae McCarthy 2015 (capt. hyb. *F. chaus* × *P. bengalensis; F. catus* × *P. viverrina*)

Felis × *Prionailurus* (= *Felis bengalensis* Felinae Crompton 2006, www.messybeast.com 2012, http://en.wikipedia.org/wiki/Felid_hybrid 2012, McCarthy 2015 (capt. hyb. *F. catus* × *P. bengalensis; F. catus* × *P. rubiginosa*)

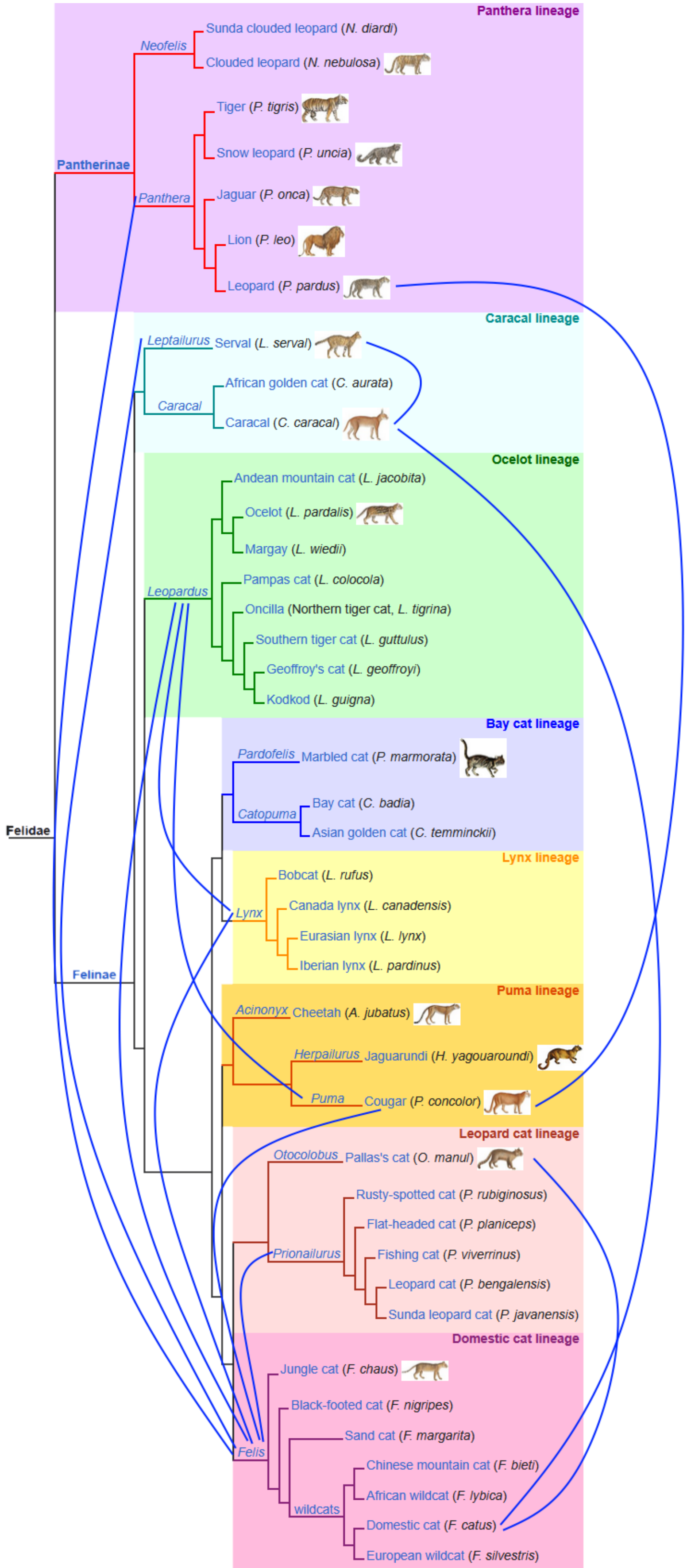
Felis × *Puma concolor* Felinae Crompton 2006, McCarthy 2015

Leopardus × *Lynx* Felinae McCarthy 2015 (capt. hyb. *Leopardus pardalis* × *Lynx rufus*)

Leopardus × *Puma concolor* Felinae Crompton 2006, McCarthy 2015 (capt. hyb. *L. pardalis* × *P. concolor*)

Lynx rufus × *Prionailurus bengalensis* Felinae McCarthy 2015 ("??")

Panthera pardus × *Puma concolor* **ISF** Pantherinae × Felinae (→ "Pumapard") Hagenbeck ca. 1900, Crompton 2006, http://www.messybeast.com/genetics/hyb-pumaxleop.htm 2012, http://en.wikipedia.org/wiki/Pumapard 2012, McCarthy 2015 (capt. hyb.)



Felidae: Hybridization within the phylogeny according to en.wikipedia 2025, CC BY 4.0 (cf. Li G et al. 201. doi:10.1101/gr.186668.114).

References:
Bartlett (1861) On the breeding of the larger Felidae. Proc. Zoolog. Soc. 1861, 140. *Panthera* interspecific.
Braun H-B (2011) Pünktchen und Streifen. Warum sind die Raubkatzen so schön und doch so unterschiedlich? Ihre unterschiedlichen Zeichnungen lassen sich mit der Annahme eines polyvalenten Grundtyps bei den Katzen vereinbaren. Stud. Integrale J. 18, 52–53. Interesting additions to the feline basic type.
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Dubost G & Royere JY (1993) Hybridization between ocelot (*Felis pardalis*) and puma (*Felis concolor*). Zoo Biol. 12, 277–283. *Felis* interspecific
Hartwell S (2012) Domestic × wildcat hybrids – mistaken identity hybrids. http://www.messybeast.com/small-hybrids/false-hybrids.htm
Pendragon B & Winkler N (2011) The family of cats – delineation of the feline basic type. J. Creat. 25, 118–124. https://creation.com/the-cat-family.
Robinson DA & Cavanaugh DP (1998) Evidence for a holobaraminic origin of the cats. Creation Res. Soc. Quarterly 35, 2–14.
www.messybeast.com/genetics/hybrid-cats.htm

Carnivora: Mustelidae 22: 70 (suborder Caniformia)

mustelids = Marder

9 subfamilies

"There are some documented intrageneric hybridizations in the genus *Mustela*, but alleged intergeneric hybrids seem questionable (Chang 1965; Chang 1968; Gray 1972; Lodé, Guiral, and Peltier 2005, Wu and Chang 1973)." Lightner et al. 2012

"No possibility of crossbreeding between European mink [*Mustela lutreola*] and American mink [*Neogale vison*] … or Siberian weasel [*Mustela sibirica*] … was proven. Hybrid embryos of these species obtained in laboratory conditions exhibited pathological characteristics and were resorbed in a short time" Skorupski J (2020. doi:10.3390/genes11111332)

Aonyx cinereus (= *Lutra cinerea*) × *Lutrogale perspicillata* (= *Lutra perspicillata*) Lutrinae McCarthy 2015 (capt. hyb.), Moretti et al. 2017

Martes foina or *martes* × *Mustela putorius* **ISF** Gulolinae × Mustelinae McCarthy 2015 (nat. hyb., questionable)

Martes martes × *Martes zibellina* **IS** Monakhov VG & Uspenskaya OD (2011. doi: 10.1134/S0012496613010171)

Meles anakuma × *Meles meles* **IS** possible hybrid according to the intermediate morphology. Baryshnikov G et al. (2002. doi: 10.15298/rusjtheriol.01.2.07)

Meles meles × *Meles leucurus* **IS** Kinoshita E et al. (2018. https://doi.org/10.1016/j.mambio.2018.05.003)

Mustela erminea × *Mustela putorius* (capt. hyb.) **IS** https://www.zobodat.at/pdf/Jb-

Verein-Schutz-Alpenpfl-Tiere_29_1964_0053-0060.pdf

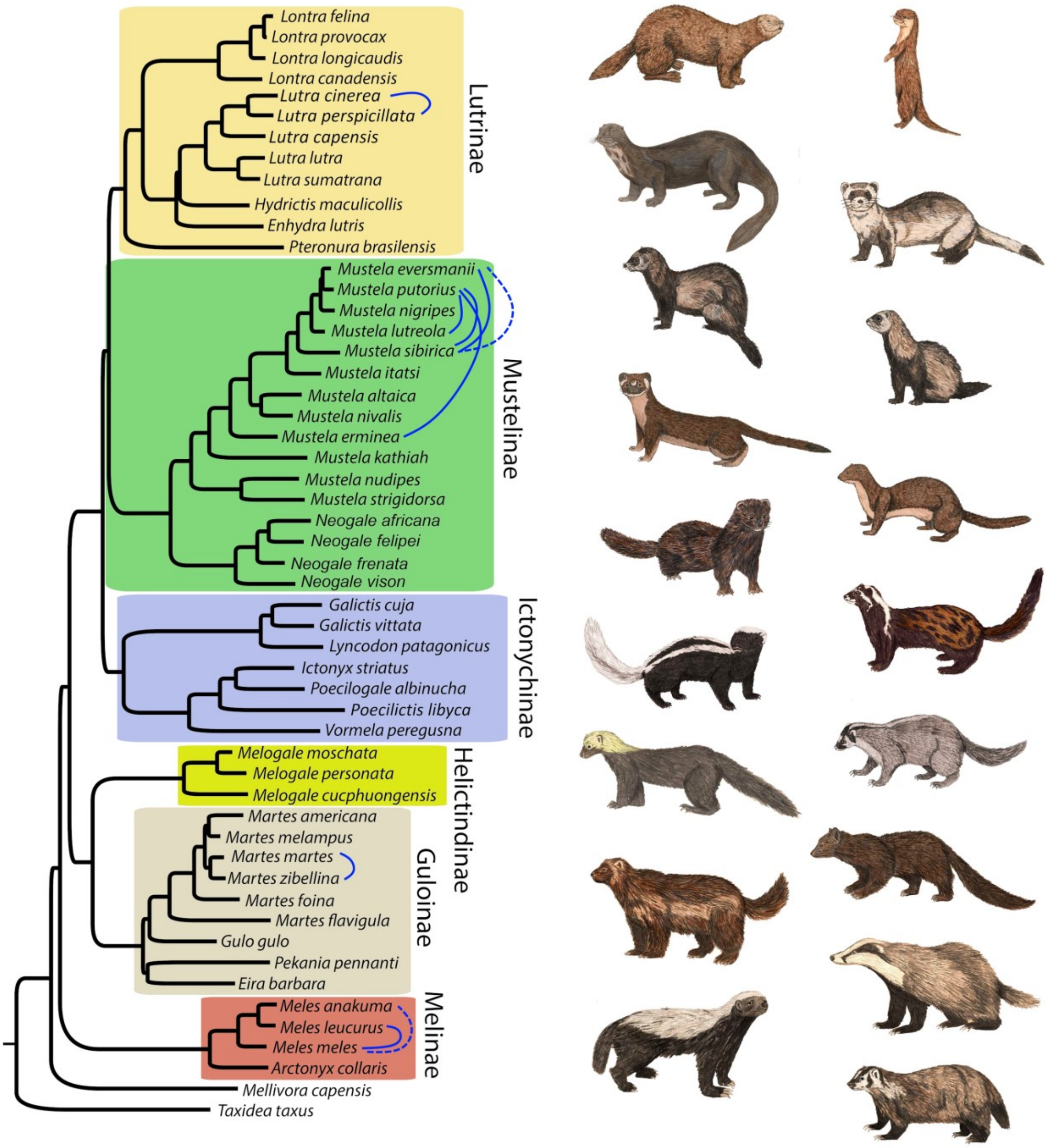
Mustela eversmanii × *Mustela putorius* possible hybrid according to intermediate morphology **IS** Cserkész et al. 2020

Mustela eversmanii × *Mustela sibirica* **IS** Cserkész et al. 2020

Mustela (putorius) furo × *Mustela putorius* **IS** https://en.wikipedia.org/wiki/Polecat%E2%80%93ferret_hybrid

Mustela putorius × *Mustela sibirica* Cserkész et al. 2020

Mustela lutreola × *Mustela putorius* **IS** Cserkész et al. 2020, https://en.wikipedia.org/wiki/Polecat%E2%80%93mink_hybrid; http://messybeast.com/genetics/hybrid-viverrid-mustelid.htm



Mustelidae: Hybridization within the phylogeny according to en.wikipedia 2025 (cf. ChrisJLaw, CC BY-SA 4.0)

References:

Cserkész T et al. (2020) Intra- and interspecific morphological variation in sympatric and allopatric populations of *Mustela putorius* and *M. eversmanii* (Carnivora: Mustelidae) and detection of potential hybrids. Mammal Research. https://doi.org/10.1007/s13364-020-00543-6.

Carnivora clade Pinnipedia → order Pinnipedia

Carnivora: Ursidae 5: 8 + extinct taxa (suborder Caniformia)

bears = Bären, Großbären

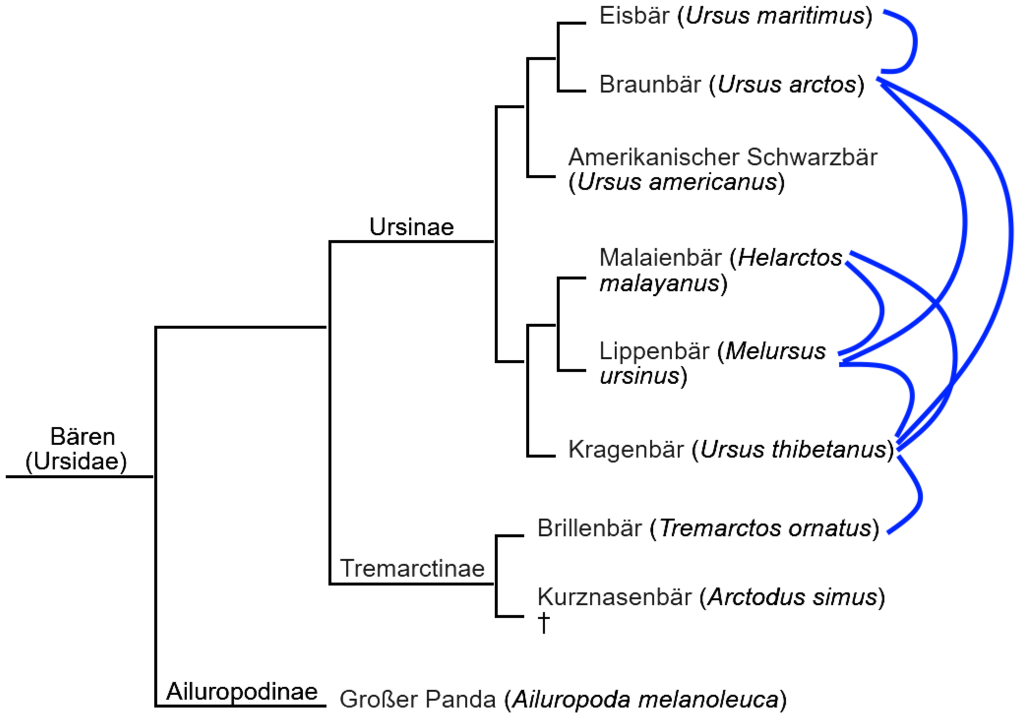
3 extant subfamilies:

Ursinae 3: 6: *Helarctos 1 malayanus* (= sun bear), *Melursus 1 ursinus* (Lippenbär = sloth bear), *Ursus 4 americanus* (Amerikanischer Schwarzbär), *Ursus arctos* (Braunbär = brown bear), *Ursus maritimus* (Eisbär = polar bear = *Thalarctos° maritimus*), *Ursus thibetanus* (Asiatischer Schwarzbär = Asian black bear = *Selenarctos° thibetanus*)

Ailuropodinae 1: 1: *Ailuropoda melanoleuca* (Großer Panda = giant panda)

Tremarctinae 1: 1 *Tremarctos ornatus* (Brillenbär = spectacled bear). This is the only extant genus of the subfamily. – The extinct genus *Arctodus* (short faced bear = Kurznasenbär) belongs here.

Probably **basic type family Ursidae subfamilies Ursinae + Tremarctinae** (5: 8), at least for extant species: Zeitz 2011, 2013 (unpubl., Fachtagung Biologie Wort und Wissen). Among Ursidae, two of the three subfamilies (Tremarctinae and Ursinae) have interbred. Since the extinct short-nosed bear (*Arctodus*) is closely related to the extant genus *Tremarctos* within subfamily Tremarctinae (cf. Abella et al. 2012), it can be included here. No hybrids are known from the giant panda *Ailuropoda*, which forms its own subfamily Ailuropodinae.



Ursidae: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (Kumar V et al. 2017. doi:10.1038/srep46487).

Helarctos malayanus × *Melursus ursinus* Ursinae Asakura 1969, Gray 1972, Van Gelder 1977, en.wikipedia 2012, McCarthy 2015

Helarctos malayanus × *Ursus* (= *Selenarctos*°) *thibetanus* Ursinae McCarthy 2015 (nat. hyb. Cambodia = Galbreath et al. 2008)

Melursus ursinus × *Ursus arctos, thibetanus* Ursinae Van Gelder 1977, McCarthy 2015

Tremarctos ornatus × *Ursus thibetanus* **ISF** Tremarctinae × Ursinae (capt. hyb.) Mondolfi & Boede 1981, Mondolfi 1983, Torres 2012, McCarthy 2015

Ursus arctos × *Ursus* (= *Selenarctos*°) *thibetanus* **IS** Ursinae Gray 1972, Van Gelder 1977, en.wikipedia 2008, McCarthy 2015 (capt. hyb.)

Ursus arctos × *Ursus* (= *Thalarctos*°) *maritimus* **IS** Ursinae Martin 1876, Kowalska 1962, 1965, 1969, Gray 1972, Van Gelder 1977, en.wikipedia 2008, McCarthy 2015 (nat. hyb., capt. hyb.)

References:

Abella J et al. (2012) *Kretzoiarctos* gen. nov., the oldest member of the giant panda clade. PLOS ONE 7, e 48985. https://doi.org/10.1371/journal.pone.0048985.

Asakura S (1969) A note on a bear hybrid, *Melursus ursinus* × *Helarctos malayanus*, at Tama Zoo, Tokyo. Int. Zoo Yearbook 9, 88.

Galbreath GJ et al. (2008) An apparent hybrid wild bear from Cambodia. Ursus 19 (1), 85–86.

Hennigan T (2009) Interpreting an unusual arctic bear within a creation model of origins. http://www.answersingenesis.org/articles/aid/v4/n1/grolar-bear

Kowalska Z (1962) Intergeneric crossbreed of the brown bear *Ursus arctos* L., and the

polar bear *Thalarctos maritimus* (Phipps). Przeglad Zoologiczny 6, 230–231. [Polish with English summary]
Kowalska Z (1965) Cross breeding between a female European brown bear and a male polar bear in Lodz Zoo. Przeglad Zoologiczny 9, 313–319. [Polish with English summary]
Kowalska Z (1969) A note on bear hybrids *Thalarctos maritimus* and *Ursus arctos* at Lodz zoo. International Zoo Yearbook 9, 89.
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Tyler DJ (1997) Adaptations within the bear family: A contribution to the debate about the limits of variation. Creation Matters 2, 1–4. http://www.creationresearch.org/creation_matters/97/cm9709.html *Helarctos malayanus × Melursus, Thalarctos (= Ursus) maritimus) × Ursus arctos.*
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Zeitz J (2013, unpubl.) Großbären und Kleinbären als Grundtypen/Baramins. Fachtagung Biologie. Wort und Wissen.
https://en.wikipedia.org/wiki/Ursid_hybrid 2012
http://www.messybeast.com/genetics/hybrid-bears.htm 2012

Cetacea 2 suborders, 13 families, 24: 94

whales = Wale

2 suborders:
Mysticeti (baleen whales = Bartenwale): 3 families Balaenopteridae (incl. Eschrichtiidae) 3: 10, Balaenidae 2, Cetotheriidae 1.
Odontoceti (toothed whales = Zahnwale) 10 families Monodontidae 2, Delphinidae 16, Phocoenidae 3, …

Cetacea: Balaenopteridae (incl. Eschrichtiidae) 3: 10 + 12 extinct genera (suborder Mysticeti)

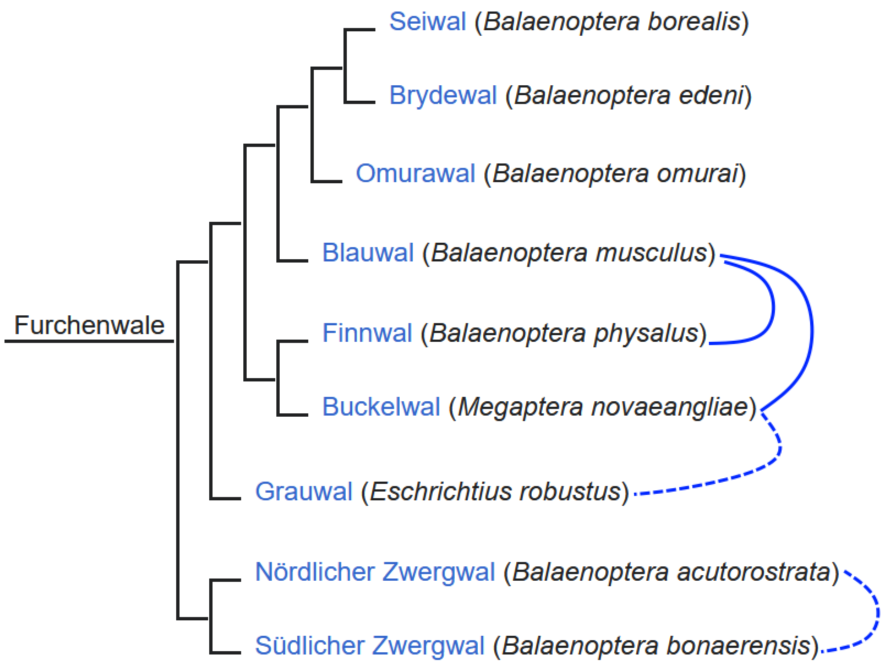
rorquals = Furchenwale

Eschrichtius robustus, sometimes separated as a family of its own Eschrichtiidae is included here, according to McGowen et al. 2019.

Balaenoptera 8 physalus (fin whale = Finnwal) (incl. *Pterobalaena acuturostrata, boanaerensis* and *Rorqualus borealis, brydei, edeni, musculus* (blue whale, Blauwal), *omurai*), *Eschrichtius 1 robustus* (gray whale = Grauwal), *Megaptera 1 novaeangliae* (humpback whale = Buckelwal).

Possibly **basic type family Balaenopteridae** (3: 10) including *Eschrichtius robustus.* It is likely, but not yet confirmed, that the gray whale (*Eschrichtius*), which was recently added here and was previously considered a separate family, belongs to this group. Perhaps the basic type also includes other families.

Balaenoptera acutorostrata × *Balaenoptera bonaerensis* **IS** Cocks 1887 (nat. hyb.) Glover, McCarthy 2015, Crossman et al. 2016 ("probable")
Balaenoptera musculus × *Balaenoptera physalus* **IS** Cocks 1887 (nat. hyb., detailed information in Pampulie et al. 2021), Crossman et al. 2016, McCarthy 2025
Balaenoptera musculus × Megaptera novaeangliae Folkens et al. 2002. (nat. hyb. in the South Pacific, cited by McCarthy as "well documented")
Eschrichtius robustus × *Megaptera novaeangliae* McCarthy 2015 (NHR. Waddell et al. (2000, p. 317) mention a hybrid but give no details. CON: Pacific). **Unconfirmed, but possible**



Balaenopteridae (incl. Eschrichtiidae): Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. McGowen MR et al. 2020. doi:10.1093/sysbio/syz068).

References:

Árnason Ú et al. (2018) Whole genome sequencing of the blue whale and other rorquals find signatures for introgressive gene flow. Science Advances 4, no. 4.

Cocks AH (1887) The fin whale fishery of 1886 on the Lapland coast. Zoologist 11, 207–222.

Folkens PA et al. (2002) Guide to marine mammals of the world. New York: A. A.

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McGowen et al. (2019) Phylogenomic resolution of the Cetacean tree of life using target sequence capture. Systematic Biology 69, 479–501.
Pampoulie C et al. (2021) Evidence of unidirectional hybridization and second-generation adult hybrid between the two largest animals on Earth, the fin and blue whales. Evol Appl. 14, 314–321.

Cetacea: Eschrichtiidae → Cetacea: Balaenopteridae

Cetacea: Delphinidae 18: 40 + some 12 extinct genera (suborder Odontoceti)

Oceanic dolphins = Delfine

The subdivision varies much as to the author. We follow the division by the Society for Marine Mammalogy's taxonomic Committee (2021), cf. en.wikipedia 2025.

Delphininae 6: *Delphinus 1 delphis*, *Lagenodelphis 1 hosei*, *Sotalia 2*, *Sousa 4*, *Stenella 5*, *Tursiops 2 adunus*, *truncatus* (bottlenose dolphin = Großer Tümmler).

Globicephalinae 8 *Feresa 1*, *Globicephala* 2, *Grampus 1 griseus* (Risso's dolphin = Rundkopfdelfin), *Orcaella 2*, *Peponocephala 1* (Breitschnabeldelfin), *Pseudorca 1*, *Steno 1* (rouph-toothed dolphin = Rauzahndelfin)

Lissodelphininae 2 *Cephalorhynchus 4*, *Lissodelphis 2.*

Orcinae 1 *Orcinus 1 orca* (orca, killer-whale)

Incertae sedis ("Lagenorhynchinae") 1 *Lagenorhynchus 6* (incl. *Leucopleurus acutus*)

Probably **basic type family Delphinidae** (18: 40), at least for the extant taxa: Scholl 2024. All three subfamilies are connected by hybridization, independent of the kind of subdivision. – The basic type is possibly more extensive.

Delphinus × Lagenorhynchus **ISF** Delphininae × "Lagenorhynchinae" McCarthy 2015 (*D. capensis* × *L. obscurus*, capt. hyb. Peru; *D. delphis* × *L. obliquidens*, capt. hyb. Japan), Crossman et al. 2016 (probable)

Delphinus delphis × Stenella coeruleoalba Delphininae Antoniou et al. 2018 (nat. hyb., Mediterr., Greece)

Delphinus delphis × Tursiops truncatus Delphininae Zornetzer & Duffield 2003 (capt. hyb.), Baird et al. 1998 (= Odell unpubl.), McCarthy 2015 (*D. capensis* × *T. truncatus* capt. hyb.; *D. delphis* × *T. truncatus* capt. hyb.), Espada et al. 2019 (*D. delphis* × *T. truncatus*, nat. hyb.)

Globicephala macrorhynchus × Tursiops truncatus **ISF** Globicephalinae × Delphininae Antrim & Cornell 1981, Sylvestre & Tasaka 1985, McCarthy 2015

Grampus griseus × Tursiops truncatus **ISF** Globicephalinae × Delphininae Gray 1972, Van Gelder 1977, Sylvestre & Tasaka 1985, Zhang et al.2014, McCarthy 2015 (capt.

hyb., nat. hyb.), Crossman et al. 2016

Lagenorhynchus obscurus × *Lissodelphus peronii* **ISF** "Lagenorhynchinae" × Lissodelphininae Yazdi 2002 (nat. hyb.), McCarthy 2015 (nat. hyb.; probably), Crossman et al. 2016

Lagenorhynchus obliquidens × *Tursiops truncatus* **ISF** "Lagenorhynchinae" × Delphininae Baird et al. 1998 (= Odell unpubl.), McCarthy 2015 (capt. hyb.; probably), http://www.zoochat.com/2/species-crossbreeds-242316/index2.html

Peponocephala electra × *Steno bredanensis* Globicephalinae McCarthy 2024 ("uncertain"), but this hybrid seems to be confirmed now; Baird et al. 2018, https://www.geo.de/natur/tierwelt/19343-rtkl-hybrid-vor-hawaii-forscher-entdecken-einzigartigen-delfin-mischling, https://www.delphinschutz.org/news-delfine/hybrid-aus-zwei-delfinarten-vor-hawaii-entdeckt/ 2018, https://en.wikipedia.org/wiki/Melon-headed_whale 2025, not yet listed in Scholl 2024.

Pseudorca crassidens × *Tursiops truncatus* **ISF** Globicephalinae × Delphininae Sylvestre & Tasaka 1985, Lee 2005, http://en.wikipedia.org/wiki/Wholphin 2012, McCarthy 2015 (capt. hyb.), Crossman et al. 2016 called "Wholphin"

Sotalia guianensis × *Tursiops truncatus* Delphininae Cabelloro & Baker 2010 (capt. hyb.)

Sousa chinensis × *Tursiops truncatus* Delphininae see McCarthy 2015 (nat. hyb.), Crossman et al. 2016 "(possible")

Stenella **IS** Delphininae (*coeruleoalba* × *longirostris* → *Stenella clymene* Choi 2014 (nat. hyb.; *attenuata* × *longirostris, clymine* × *longirostris* Silva et al. 2010 (nat. hyb., cited in Crossman et al. 2016)

Stenella frontinalis × *Tursiops truncatus* Delphininae Herzing & Johnson 1997 (interactions observed, but no hybridizations reported before 2003), McCarthy 2015 (nat. hyb., citing Herzing et al. 2003), Herzing et al. 2005 observed a hybrid!, Crossman et al. 2016

Stenella attenuata × *Tursiops truncatus* **HY** Delphininae (McCarthy 2015: *S. frontalis* is possibly a hybridogeneous taxon of this type.)

Steno bredanensis × *Tursiops truncatas* **ISF** Globicephalinae ×Delphininae Dohl et al. 1974, Van Gelder 1977 (he points out, that some authors have placed *Steno* in the family Stenidae), Sylvestre & Tasaka 1985, McCarthy 2015 (capt. hyb., nat. hyb.)

References:

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Herzing DL et al. (2005) Interspecies interactions between Atlantic spotted dolphins, *Stenella frontalis* and bottlenose dolphins, *Tursiops truncatus*, on Great Bahama Bank, Bahamas. Aquatic Mammals 29. https://www.aquaticmammalsjournal.org/article/vol-29-iss-3-herzing-et-al/ The authors observed a male hybrid in 2003.
Lee JJ (2 005) Whale-Dolphin hybrid has baby 'Wholphin'. Associated Press 2005. http://www.livescience.com/animals/ap_050415_wolphin.html
Mace SR & Wood TC (2005) Statistical evidence for five whale holobaramins (Mammalia: Cetacea). Occasional Papers of the BSG 5:15.
Scholl B (2024) Delfine – ein sportlicher Grundtyp. Stud. Integrale J. 31, 39–42.
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Cetacea: Monodontidae 2: 2 + several extinct genera (suborder Odontoceti)

monodontids = Gründelwale

Monodon monoceros (narwhal = Narwal), *Delphinapterus leucas* (beluga = Weißwal).

Basic type family Monodontidae (2: 2): Borger 2020, at least for the extant taxa. The two living genera are connected by hybridization. The tusk of the male narwal is unique in animals (Binder 2006). The basic type is possibly more extensive.

Delphinapterus leucos × Monodon monoceros Heide-Jorgensen & Reeves 1993 (nat. hyb., first hybridization only supposed), Skovrind et al. 2019 (hybridization confirmed), Saey 2019 (hybridization confirmed by DNA-analysis). Crossman et al. 2016. The hybrid is called "Narluga".

References:

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Borger P (2020) Der Belwal, ein Mischling aus Beluga und Narwal. Stud. Integrale J. 27, 57–58. http://www.si-journal.de/jg27/heft1/sij271-online.pdf

en.wikipedia: Narluga https://en.wikipedia.org/wiki/Narluga

Heide-Jorgensen MP & Reeves RR (1993) Description of an anomalous monodontid skull from West Greenland: a possible hybrid? Mar. Mammal. Sci. 9, 258–268.

Saey TH (2019) DNA confirms a weird Greenland whale was a narwhal-beluga hybrid. https:// www.sciencenews.org/article/dna-confirms-greenland-whale-beluga-hybrid.

Skovrind M et al. (2019) Hybridization between two high Arctic cetaceans confirmed by genomic analysis. Sci. Rep. 9 (1).

Cetacea: Phocoenidae 3: 7 + 4 extinct genera (suborder Odontoceti)

porpoises = Schweinswale

Neophocaena 2, Phocoena 4 (incl. *Australophocoena dioptrica*), *Phocoenoides 1 dalli*.

Possibly **basic type family Phocoenidae** (3: 7), for the extant taxa, but hybrids with the basal genus *Neophocaena* are unknown.

Phocoena phocoena × *Phocoenoides dalli* Baird et al. 1998, Willis et al. 2004, en.wikipedia 2015, McCarthy 2015 (nat. hyb.), Crossman et al. 2016

References:

Baird RW et al. (1998) An intergeneric hybrid in the family Phocoenidae. Canad. J. Zool. 76, 198–204. Video: http://wn.com/dall%27s_porpoise?orderby=relevance&upload_time=today.

Willis PM, Crespi BJ, Dill LM, Baird RW & Hanson MB (2004) Natural hybridization between Dall's porpoises (*Phocoenoides dalli*) and Harbour porpoises (*Phocoena phocoena*). Canad. J. Zool. 82, 828–834.

Chiroptera 2 suborders, 21 families, 1400 species + extinct taxa

bats = Fledermäuse etc., Flattertiere

2 suborders

For interspecific hybrids see https://www.macroevolution.net/vesper-bat-hybrids.html

Cingulata 2 extant families + 3 extinct families (superorder Xenarthra)

armadillos = Gürteltiere

2 extant families: Chlamyphoridae 7 + many extinct taxa, Dasypodidae 1: 8.

Cingulata: Dasypodidae 1: 8

long-nosed armadillos = Langnasen-Gürteltiere

Dasypus 8

Basic type family Dasypodidae (1: 8), anatomically well-defined (P. Klöckner, pers comm. 2008). Hybrids are unknown, though one species has the name *Dasypus hybridus*.

Diprotodontia 17: 155 + many extinct taxa (now part of the infraclass Marsupialia)

3 suborders:

Vombatiformes 2 families

Phalangeriformes 2 families

Macropodiformes 7 families

Diprotodontia: Macropodidae 11: 61 + many extinct taxa (suborder Macropodiformes)

kangaroos, wallabies and allies = Kängurus

2 extant subfamilies:

Macropodinae 10: 67 + extinct genera *Dendrolagus 14, Dorcopsis 4, Dorcopsulus 2, Lagorchestes 2, Lagostrophus 1, Macropus 4, Notamacropus 8, Onychogalea 2, Osphranter 4* (incl. *Megaleia rufa*), *Petrogale 17, Setonix 1, Thylogale 7, Wallabia 1.*

Lagostrophinae 1: 1 *Lagostrophus 1 fasciatus* + 2 extinct genera

Probably **basic type Macropodidae subfamily Macropodinae** (10: 67), see the figure below.

Dorcopsis luctuosa × *Thylogale browni* McCarthy 2015 **HY** (possibly *Dorcopsulus macleayi* is of hybridogeneous origin *Dorcopsis luctuosa* × *Thylogale browni*: http://www.macroevolution.net/kangaroo-hybrids.html), messybeast 2025 (nat. hyb. New Guinea, where they are separated by a population of Macleay's Dorcopsis/Papuan Forest Wallaby (*Dorcopsulus macleayi*) which is intermediate in appearance)

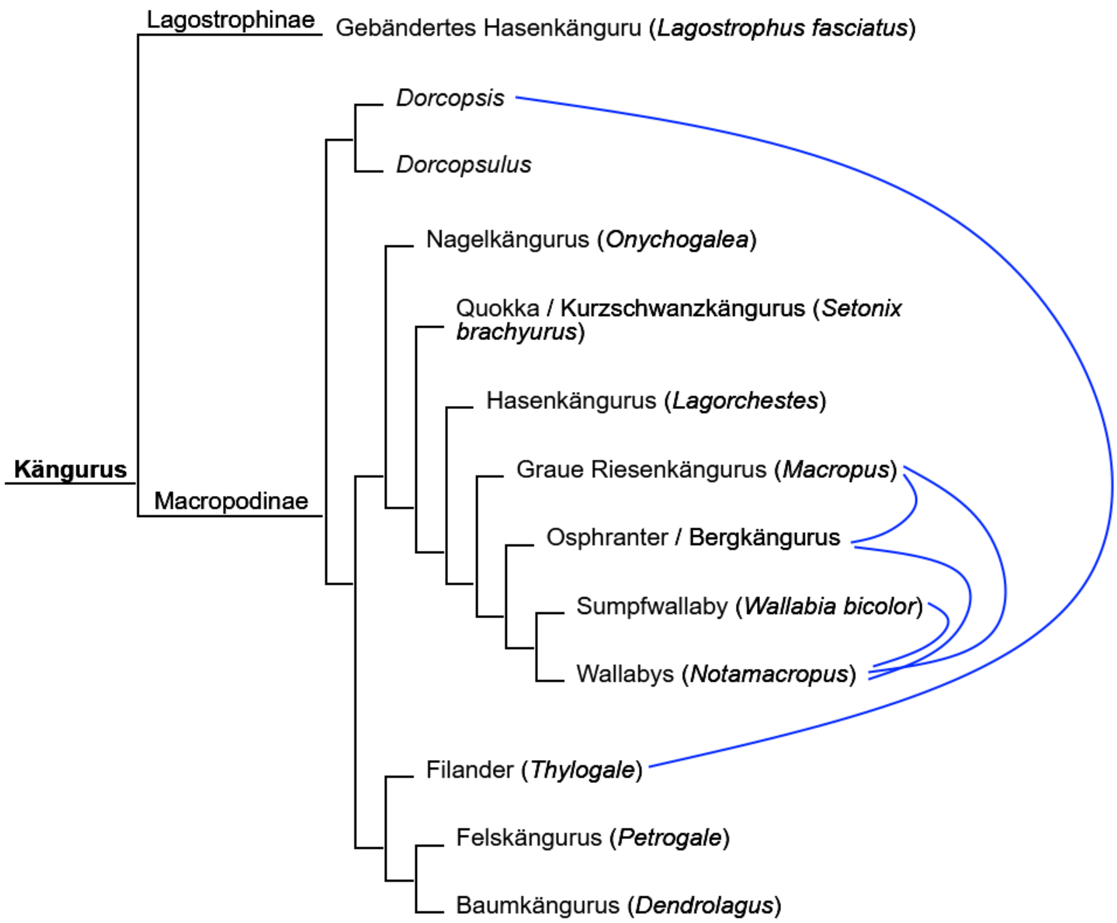
Macropus × *Megaleia*° *rufa* (= *Osphranter rufus*) **IS** Gray 1972 (viable, capt. hyb.), Van Gelder 1977, McCarthy 2015 (capt. hyb., nat. hyb. *Macropus*° (= *Notamacropus*) *agilis* × *Megaleia*° *rufa* (= *Osphranter rufus*), *Macropus fuliginosus* × *Megaleia*° *rufa* (= *Osphranter rufus*); *Macropus giganteus* × *Megaleia*° *rufa* (= *Osphranter rufus*); *Macropus* (= *Osphranter*) *robustus* × *Megaleia*° *rufa* (= *Osphranter rufus*)

Macropus × *Thylogale* Van Gelder 1977, en.wikipedia 2011, McCarthy 2015 (capt. hyb. *Macropus* (= *Notamacropus*) *rufogriseus* × *T. thetis*)

Macropus (= *Notamacropus*) × *Wallabia* Gray 1972, Van Gelder 1977 (viable, capt. hyb.), en.wikipedia 2011, McCarthy 2015 (capt. hyb. *M. agilis* × *W. bicolor; M. eugenii* × *W. bicolor; M. rufogriseus* × *W. bicolor;* all *Macropus* here are actually *Notamacropus;* see also Smith et al. 1979)

Megaleia° (= *Macropus* p. p.) × *Osphranter* **IS** Gray 1972 (*Me.* (= *O.*) *rufa* × *O. antilopinus, Me.* (= *O.*) *rufa* × *O. robustus*, viable, capt. hyb.), Van Gelder 1977

Thylogale × "*Wallabia*" Gray 1972 (*T. thetis* × *W. rufogrisea frutica* viable, capt. hyb.), Van Gelder 1977 → *Macropus* × *Notamacropus*, because *Wallabia rufogriseus* has been transferred to *Notamacropus rufogriseus*



Macropodidae: Hybridization within the phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Celik et al. 2019).

References:

Celik M et al. (2019) A molecular and morphometric assessment of the systematics of the *Macropus* complex clarifies the tempo and mode of kangaroo evolution. Zoological Journal of the Linnean Society 186, 793–812. doi: 10.1093/zoolinnean/zlz005

Smith MJ, Hayman DL & Hope RM (1979) Observations on the chromosomes and reproductive systems of four macropodine interspecific hybrids". Australian Journal of Zoology 27 (6), 959–972. doi:10.1071/ZO9790959; https://www.publish.csiro.au/zo/ZO9790959

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https://en.wikipedia.org/wiki/Macropod_hybrid (2025)

http://www.messybeast.com/genetics/hybrid-marsupials.htm (2025)

Diprotodontia: Phalangeridae 6: 28 (suborder Phalangeriformes)

Ailurops, Phalanger, Spilocuscus, Strigocuscus, Trichosurus, Wyulda.

Phalanger × *Strigocuscus* see McCarthy 2015:
http://www.macroevolution.net/phalangerid-hybrids.html

Eulipotyphia 4 families + fossil taxa

"Insectivora" = Insektenfresser

Eulipotyphia: Erinaceidae 10: 24 + fossil genera

hedgehogs + moonrats = Igel

2 subfamilies

Erinaceus concolor × *Erinaceus ("Hemiechinus") europaeus* **IS** Erinaceinae McCarthy 2015
http://www.macroevolution.net/hedgehog-hybrids.html
Atelerix albiventris × *Atelerix algirus* **IS** Erinaceinae
https://uk.inaturalist.org/taxa/990532-Atelerix-albiventris---Atelerix-algirus (2025); "This mitonuclear discordance could be the result of an ancient hybridization event between the two species" El-Farhati H et al. 2021, 806. doi: 10.3897/vz.71.e70989

Insectivora → Eulipotyphia

Lagomorpha 2 extant families, 12: 99

Leporidae 11: 70, Ochotonidae (pikas = Pfeifhasen, Pikas) 1: 29 + many extinct species

Lagomorpha: Leporidae 11: 70 + 2 extinct genera

rabbits and hares = Hasen

2 subfamilies: Leporinae 8: 49, Palaeolaginae 3: 6.

In **family Leporidae**, combining the two phylogenies of Huang Y-L et al. (2019, Fig. 1. https://doi.org/10.1080/23802359.2019.1681321) and Shan W et al. (2021, Fig. 5. doi: 10.3897/zookeys.1012.59035) probably at least all members of the **genus *Lepus*** with 30 species belong to the same basic type.

Lepus timidus × *Lepus europaeus* **IS** Koch W 1964.
https://www.zobodat.at/publikation_articles.php?id=309919
Lepus × *Oryctolagus cuniculus* Leporinae Rorig 1912 (nat. hyb. *L. europaeus.* × *O. cuniculus;* McCarthy 2015: presumed, artificial hybridization failed), Gray 1972 (presumed; art. hyb., embryos failed to develop), McCarthy 2015 (*L. americanus* ×

O. cuniculus; "the fertilized ova apparently all degenerate".)
Oryctolagus cuniculus × *Sylvilagus* Leporinae Gray 1972 (presumed; art. hyb., only a few eggs survived up to the blastocyst stage)

References:
Rorig G (1912) Über einen Hasen-Kaninchenbastard aus freier Wildbahn. D. Jägerzeitung (Neudamm) 1912, 601–607 etc.

Marsupialia → Diprotodontia

Perissodactyla 3 extant families, 6: + extinct taxa

Equidae 1: 6-8, Rhinocerotidae 4: 5, Tapiridae 1: 4

Monroe JS (1985) Basic created kinds and the fossil record of Perissodactyls. Creation Evolution J. 5, 4–30. http://ncse.com/cej/5/2/basic-created-kinds-fossil-record-perissodactyls

Perissodactyla: Equidae 1: 6–8 + some 30 prehistoric species

horses = Pferdeartige

Equus africanus (African wild ass), *caballus* (domestic horse), *ferus* (wild horse), *grevyi* (Grévy's zebra), *hemionus* (onager), *kiang* (kiang), *quagga* (plains zebra), *zebra* (mountain zebra)

Basic type family Equidae (1: 8) Stein-Cadenbach (1993, 2025), for the extant species. – For extinct taxa cf. Crompton 2013.

Equus asinus° (= *Asinus°*) × *Equus caballus* **IS** Simpson 1961, Gray 1972.
Mule = *E.* (*africanus*) *asinus* ♂ × *E.* (*ferus*) *caballus* ♀ (mostly infertile)
Hinny = *E.* (*africanus*) *asinus* ♀ × *E.* (*ferus*) *caballus* ♂ (infertile)
Equus quagga or *zebra* × *Equus asinus* or *caballus* etc. **IS** Zebroids*: see* http://en.wikipedia.org/wiki/Mule: Zeedonk or Zonkey, a zebra/donkey cross.; Zorse, a zebra/horse cross; Zony or Zetland, a zebra/pony cross („zony“ is a generic term; „zetland“ is specifically a hybrid of the Shetland pony breed with a zebra)

References:
Cavanaugh DP, Wood TC & Wise KP (2003) Fossil Equidae: A monobaraminic, stratomorphic series. p 143–153 in: Ivey RL (Ed.) Proc. Fifth Int. Conf. on Creationism. Pittsburgh: Creation Science Fellowship.

Crompton N (2013) Die Entstehung der Pferdeartigen. Genesisnet Online. https://genesis-net.de/wp-content/uploads/2025/01/Die_Enstehung_der_Pferdartigen.pdf
Garner P (1998) It's a horse, of course! A creationist view of phylogenetic change in the equid family. Origins 25, 13–23.
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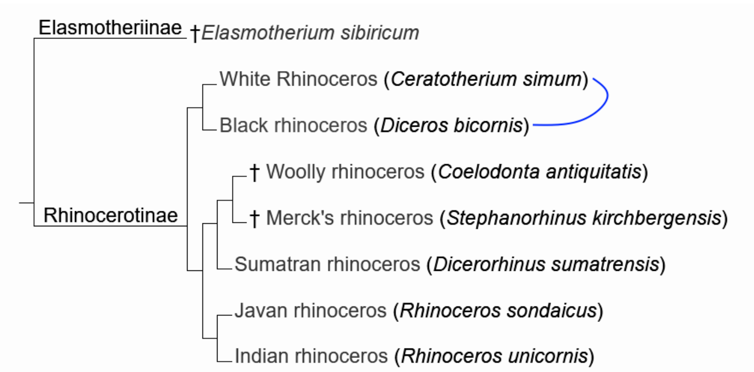
Simpson GG (1961) Principles of animal taxonomy. New York: Columbiauniv. Press.
Stein-Cadenbach H (1993) Hybriden, Chromosomenstrukturen und Artbildung bei Pferden (Equidae). S. 225–244 in: Scherer, S. (Hg.) Typen des Lebens. Berlin: Pascal.
Stein-Cadenbach H (2025) Hybrids, chromosome structure, and speciation within the horses (Equidae). In: Sanders RW (ed.) Basic types of life. Tulsa, Oklahoma: Blyth Institute Press, pp. 343–368. Translation of the German edition 1993

Perissodactyla: Rhinocerotidae 4: 5 + several extinct subfamilies and other extinct taxa

rhinoceros = Nashörner

Ceratotherium 1, Diceros 1, Rhinoceros 2, Dicerorhinus 1

Ceratotherium bicornis × Diceros simium Dobigny et al. 2006, McCarthy 2015 (capt. hyb.)



Rhinocerotidae: Hybridization within a phylogeny according to en.wikipedia 2025, CC BY 4.0 (cf. Liu S et al. 2021. doi:10.1016/j.cell.2021.07.032).

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Dobigny G, Waters PD, Robinson TJ (2006) Absence of hypomethylation and LINE-1 amplification in a white × black rhinoceros hybrid. Genetica 127, 81–86.

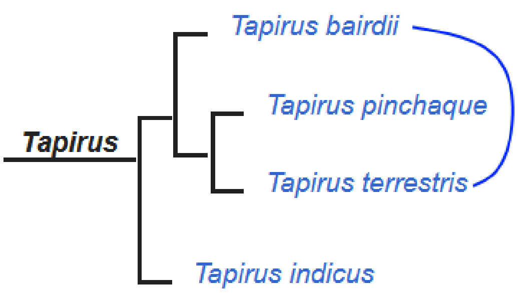
Perissodactyla: Tapiridae 1: 4 + ca. 12 extinct genera

tapirs = Tapire

Tapirus 4 (incl. *Acrocodia indica*)

Probably **basic type family Tapiridae** (1: 4), for the extant species. Anatomically well-defined (P. Klöckner, pers comm. 2008).

Tapirus bairdii × *T. terrestris* **IS** messybeast 2025 (bred at the San Francisco Zoo around 1968 and a female hybrid was back-crossed to a Baird's Tapir resulting in a 2nd generation hybrid around 1970)



Rhinocerotidae: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Steiner CC & Ryder OA 2011. https://doi.org/10.1111/j.1096-3642.2011.00752.x).

Pholidota 1 extant family 3: 8 + 3 extinct families

Pholidota: Manidae 3: 8 + 9 extinct species

pangolins = Schuppentiere

Manis 4, *Phataginus* 2, *Smutsia* 2

Probably **basic type family Manidae** (3: 8), because anatomically well-defined (P. Klöckner, pers comm. 2008).

Pilosa 4 extant families + 6 extinct families (superorder Xenarthra)

pilosans = Zahnarme

2 suborders:
Folivora 2 extant families Bradypodidae 1: 5, Choloepodidae 1: 2,
Vermilingua 2 families + 6 extinct families

Pilosa: Bradypodidae 1: 5 (suborder Folivora, superfamily Megatherioidea)

three-toed sloths = Dreifinger-Faultiere

Bradypus 5

Pinnipedia 3 families, 19: 36 (now often part of Carnivora) + extinct taxa

seals = Robben

Odobenidae (walruses= Walrosse) 1: 1, Otariidae 7: 16, Phocidae 11: 19

Pinnipedia: Otariidae 7: 16 + extinct taxa

eared seals, otariids, otaries = Ohrenrobben

Arctocephalus 8, Callorhinus 1, Eumetopias 1, Neophoca 1, Otaria 1 flavescens = byronia°, Phocarctos 1, Zalophus 3.

Basic type family Otariidae (7: 16), due to intergeneric connections between distinct genera (see the figure below), monophyletic.

Arctocephalus australis × Otaria flavescens (+ byronia) (nat. hyb. *A. a.* × *O. flavescens*, see McCarthy 2015); see also 2021: https://link.springer.com/chapter/10.1007/978-3-030-59184-7_12), (nat. hyb. Uruguay *A. a.* × *O. byronia* Franco-Trecu et al. 2016 (fertile!)

Arctocephalus pusillus × Zalophus californianus Schliemann 1968, Gray 1972 (art. hyb.), Wilson et al. 1974, Van Gelder 1977, McCarthy 2015

Callorhinus ursinus × Eumetopias jubatus (nat. hyb.) McCarthy 2015

Callorhinus ursinus × Otaria byronia Gray 1972 (alleged), McCarthy 2015 (“erroneous”)

Callorhinus ursinus × Zalophus californianus (nat. hyb., capt. hyb.) McCarthy 2015

Eumetopias jubatus × Zalophus californianus (nat. hyb.) see McCarthy 2015

Otaria flavescens (= byronia) × Zalophus californianus Kirchshofer 1968, Gray 1972 (art. hyb.), Brunner 2002, McCarthy 2015

Otariidae: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Yonezawa T et al. 2009. https://doi.org/10.1016/j.gene.2009.01.022).

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Brunner S (2002) A probable hybrid sea lion: *Zalophus californianus* × *Otaria byronia*. J. Mammalogy 83, 135–144.

Franco-Trecu V et al. (2016) Sex beyond species: the first genetically analyzed case of intergeneric fertile hybridization in pinnipeds. Evolution & Development 18, 127–136.

Kirchshofer R (1968) Notizen über zwei Bastarde zwischen *Otaria byronia* (de Blainville) und *Zalophus californianus* (Lesson). Z. Säugetierkunde 33, 45–49.

Schliemann H (1968) Notiz über einen Bastard zwischen *Arctocephalus pusillus* (Schreber, 1776) und *Zalophus californianus* (Lesson, 1828). Z. Säugetierkunde 33, 42–45.

Wilson AC, Maxson LR & Sarich VM (1974) Two types of molecular evolution: evidence from studies of interspecific hybridization. Proc. Natl. Acad. Sci. USA 71, 2843–2847. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC388568/pdf/pnas00060-0257.pdf

Pinnipedia: Phocidae 11: 19

earless seals = Hundsrobben

2 subfamilies:

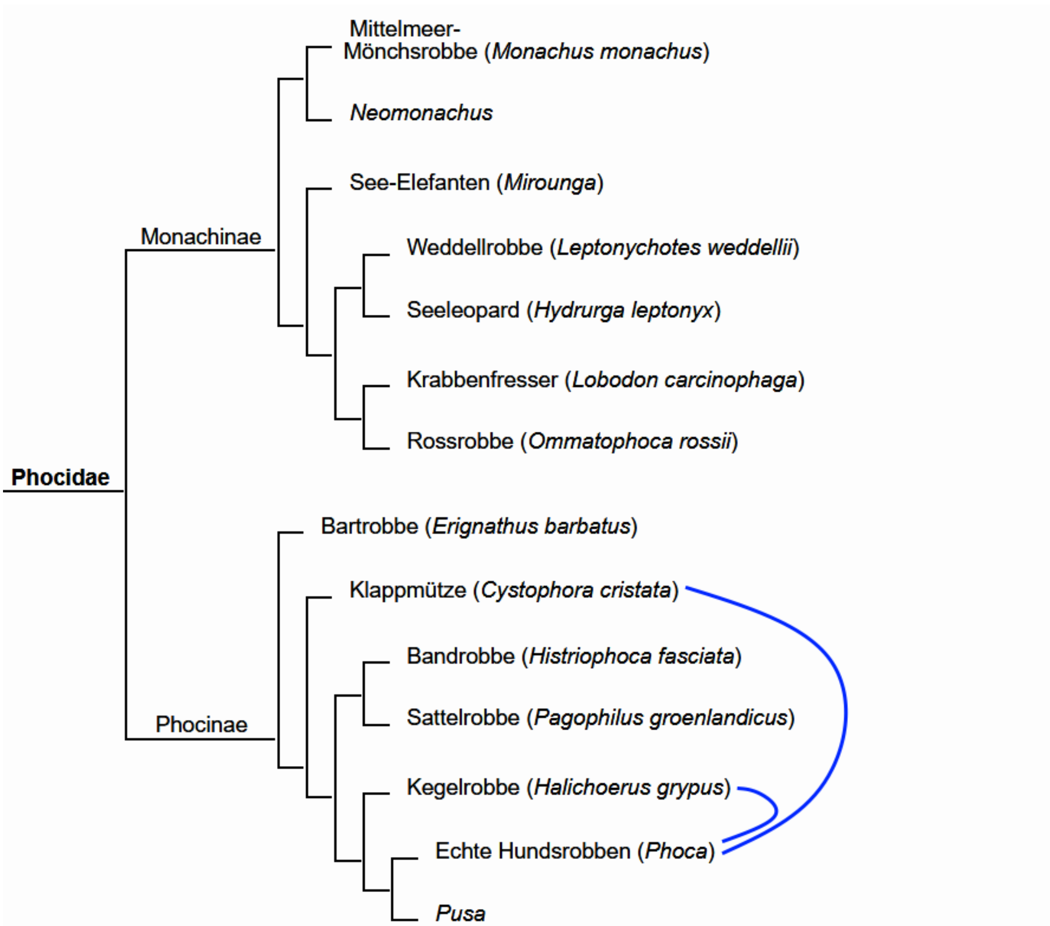
Phocinae 5: 10 *Cystophora 1, Erignathus 1, Histriophoca 1, Holichoerus 1, Phoca 6.*

Monachinae 6: 9 *Hydrurga 1, Leptonychotes 1, Lobodon 1, Monachus 3, Mirounga 2, Ommatophoca 1.*

In **family Phocidae**, probably all members of **subfamily Phocinae** (5: 10) belong to the same basic type.

Cystophora cristata × *Phoca groenlandica* Phocinae Kovacz et al. 1997, McCarthy 2015 (nat. hyb.)

Halichoerus grypus × *Phoca hispida* Phocinae Lönnberg 1929 a, b, Gray 1972 (art. hyb.), McCarthy 2015 (capt. hyb.)



Phocidae: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Scheel D-M et al. 2014. doi: 10.3897/zookeys.409.6244).

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Kovacs KM et al. (1997) A harp seal × hooded seal hybrid. Marine Mamm. Sci. 13, 460–468.

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ringed seal, *Phoca hispida annellata* Nils. Arkiv för Zoologi (Stockholm) 21 A (1/5), 1–8.
Lönnberg E (1929b) En bastard mellan grasjal, *Halichoerus grypus* ♂ och vikare *Phoca hispida annellata* ♀. Fauna och Flora Uppsala. 1929, 151–158.

Primates 2 extant suborders, 6 families

primates = Primaten

2 suborders:

Haplorhini 5 families Callitrichidae, Cebidae, Cercopithecidae, Hominidae, Hylobatidae

Strepsirrhini 1 family Lemuridae

References:

Brummel PS & Wood TC (2023) A preliminary evaluation of ape baramins. Proceedings of the International Conference on Creationism 9, 144–167. https://digitalcommons.cedarville.edu/context/icc_proceedings/article/1515/viewcontent/09_Brummel_and_Wood_1515_Preliminary_Evaluation_of_Ape_Baramins.pdf

Primates: Callitrichidae 8: 50 + extinct taxa (suborder Haplorhini)

marmosets and tamarins = Krallenaffen

Callibella, Callimico, Callithrix 6, Cebuella 2, Mico, Leontocebus, Leontopithecus, Saguinus.

Callithrix jacchus × *Cebuella pygmaea* Anzenberger et al. 2001 (*Ca. jacchus* × *Ce. pygmaea*), Neusser et al. 2005, McCarthy 2015 (capt. hyb.)

References:

Anzenberger G, Münch M, Moisson P, Petit C (2001) Intergeneric marmoset hybrids (*Cebuella pygmaea* × *Callithrix jacchus*): An important case study for callitrichid taxonomy. Folia Primatol. 72, 153.
Neusser M, Münch M, Anzenberger G & Müller S (2005) Investigation of marmoset hybrids (*Cebuella pygmaea* × *Callithrix jacchus*) and related Callitrichinae (Platyrrhini) by cross-species. Cytogenet. Genome Res. 108, 191–196.

Primates: Cebidae 3: 29 + extinct taxa (suborder Haplorhini)

new world monkeys, capuchins and squirrel monkeys = Kapuzineraffen

2 subfamilies:

Cebus 15, Saimiri 7, Sapajus 7

Primates: Cercopithecidae 24: 138 (suborder Haplorhini)

old world monkeys = Meerkatzenverwandte, Hundsaffen

2 subfamilies:
Cercopithecinae 13: 79, Colobinae 11: 59

Cercopithecinae 13: 79

2 tribes:
Cercopithecini 6: 36 *Allenopithecus, Allochrocebus, Cercopithecus, Chlorocebus, Erythrocebus, Miopithecus,*
Papionini 7: 43 *Cercocebus, Lophocebus, Macaca, Mandrillus, Papio, Rungwecebus, Theropithecus.*

Basic type Cercopithecidae subfamily Cercopithecinae (13: 79): Hartwig-Scherer 1993, 2025. The 2 tribes are connected by several hybridizations. The whole subfamily Cercopithecinae is included via C*hlorocebus* × *Macaca* (cf. Xing J et al. (2005, Fig. 2), Perelmen et al. (2011, Fig. 1+2), Shao et al. (2023, Fig. S5–S9, S11–12, S34), Cole (2023)). „Mammal Species of the World" (Wilson & Reeder 2005) lists for this subfamily 11 genera, 73 species and 89 subspecies.

Allenopithecus nigroviridis × *Cercopithecus aethipos* Cercopithecini Gray 1972 (capt. hyb., viable), Hartwig-Scherer 1993, McCarthy 2015
Cercocebus × *Cercopithecus* **IT** Papionini × Cercopithecini Gray 1972, Hartwig-Scherer 1993, McCarthy 2015
Cercocebus × *Lophocebus albigena* Papionini McCarthy 2015
Cercocebus × *Macaca* Papionini Gunning 1910, Gray 1972, Hartwig-Scherer 1993, McCarthy 2015
Cercocebus × *Mandrillus* Papionini Gray 1972, McCarthy 2015
Cercocebus × *Papio anubis* Papionini McCarthy 2015 (capt. hyb.)
Cercopithecus albugularis, mitis × *Chlorocebus* (= *Cercopithecus°*) *pygerythrus* Cercopithecini Erhart et al. 2005, de Jong & Butynski 2010, Zinner et al. 2011, McCarthy 2015, *Cercopithecus mitis* × *Chlorocebus pygerythrus:* 8,1 million years divergence time (Jong & Butynski 2010, 43f + 50f) vs. 10,1 million years (Shao et al. 2023, Fig. S12)
Cercopithecus × *Erythrocebus* Cercopithecini Gray 1972, Hartwig-Scherer 1993, McCarthy 2015
Cercopithecus cephus × *Cercopithecus nictitans* **IS** (Jong & Butynski (2010, 43f+50f): "probable" hybrid)
Cercopithecus denti × *Cercopithecus mitis doggetti* **IS** (Jong & Butynski (2010, 43f+50f): "apparent" hybrid)
Cercopithecus mona × *Cercopithecus pogonias* **IS** Jong & Butynski 2010, 43f+50f
Cercopithecus sclateri × *Cercopithecus erythrogaster* **IS** Jong & Butynski 2010, 43f+50f

Chlorocebus × *Erythrocebus patas* Cercopithecinae (capt. hyb.) McCarthy 2015

Chlorocebus × *Macaca sinica* **IT** Cercopithecinae × Papionini capt. hyb.) McCarthy 2015; *Chlorocebus pygerythrus* × *Macaca sinica, M. radiata, M. fascicularis* **IT** Cercopithecinae × Papionini Roos 2010

Chlorocebus pygerythrus × *C. sabaeus*, *C. aethiops* **IS** Roos 2010

Chlorocebus aethiops (*"Cercopithecus aethiops"*) × *Macaca* **IT** Cercopithecinae × Papionini (*C. aethiops* × *M. mulatta, radiata, sinica,* fertile), Hartwig-Scherer 1993 (*Chlorocebus aethiops* has been transferred to *Chlorocebus*)

Chlorocebus sabaeus × *Erythrocebus patas patas* Cercopithecinae „presumed" hybrid (de Jong & Butynski (2010, 43f+50f)

Comopithecus° × *Macaca* Van Gelder 1977 → *Macaca* × *Papio*

Comopithecus° × *Theropithecus* Van Gelder 1977, see *Papio* × *Theropithecus*

Cynopithecus° (= *Macaca*) *nigra* × *Macaca* **IS** Papionini Gray 1972

Macaca × *Mandrillus* Papionini Gray 1972, Hartwig-Scherer 1993, McCarthy 2015

Macaca × *Papio* Papionini Gray 1972, Hartwig-Scherer 1993, Moore et al. 1999, McCarthy 2015

Mandrillus × *Papio* Papionini Gray 1972, Hartwig-Scherer 1993, McCarthy 2015

Papio × *Theropithecus* Papionini Gray 1972, Hartwig-Scherer 1993, Jolly et al. 1997, McCarthy 2015

Papio anubis × *Theropithecus gelada* Papionini (de Jong & Butynski (2010, 43f+50f): "three probable" hybrids; 3–4 million years divergence time; Lhota et al. 2022: 4,1 million years)

Papio hamadryas × *Theropithecus gelada* Papionini Lhota et al. 2022

Rungwecebus (= *Lophocebus*) *kipunji* × *Papio cynocephalus* Papionini (nat. hyb. Tanzania: In 2005, this new taxon was described as *Lophocebus*, which obviously is the result of an intergeneric cross *Lophocebus* × *Papio* and was later called *Rungwecebus* kipunji.) Roos 2010, Zinner et al. 2009, 2011, McCarthy 2015

Colobinae 10: 67 + 7 extinct genera

langurs = Languren

2 tribes:

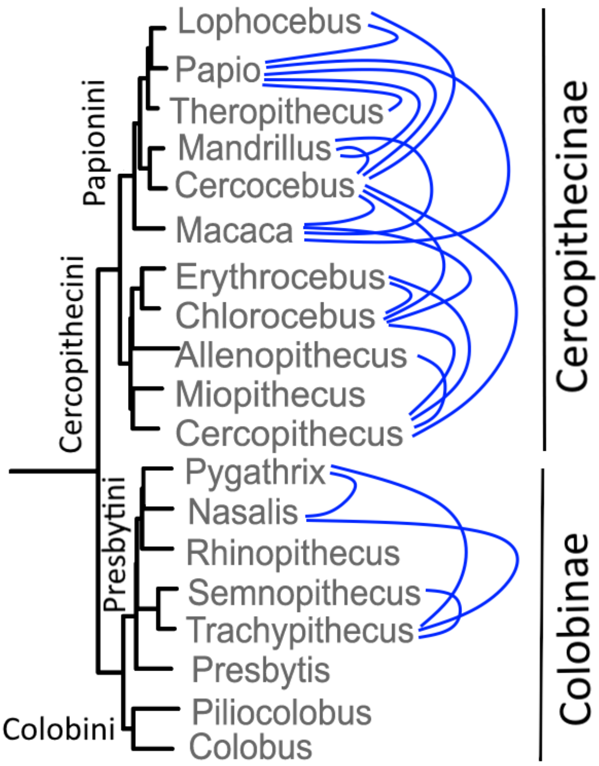
Colobini 3: 22 *Colobus 5, Piliocolobus 16, Procolobus 1 verus..*

Presbytini 7: 45 *Nasalis 1, Presbytis 11, Pygathrix 3, Rhinopithecus 5, Semnopithecus 8 entellus, vetulus, Simias 1 concolor, Trachypithecus 16 johnii, obscurus, vetulus, …*

In **Cercopithecinae subfamily Colobinae**, at least all members of **tribe Presbytini** (7: 45) seem to belong to the same **basic type** (cf. Wang et al. (2012, Fig. 1: 4 of 6 cladograms, Fig. 2), Xing et al. (2005, Fig. 2), Cole (2023); Shao et al. (2023, Fig. S5–S9, S11–12, S34)).

Colobus polykomos × *C. vellerosus* **IS** Colobini (instead of subspecies *Colobus polykomos dollmani*) Oates & McGraw 2009; more *Colobus* **IS** hybrids are listed here: https://www.macroevolution.net/old-world-monkey-hybrids.html

Nasalis larvatus × *Pygathrix nemaeus* Presbytini odd-nodes group (capt. hyb.)
McCarthy 2015, Lhota et al. 2022 (in Zoo Erfurt, Germany)
Nasalis larvatus × *Trachypithecus cristatus* Presbytini Lhota et al. 2022
Pygathrix nemaeus × *Trachypithecus hatinhensis* Presbytini Roos 2010
Semnopithecus × *Semnopithecus* (*"Trachypithecus"*°) *johnii* **IS** Presbytini langur group
Gray 1972, Rowe 1996, Roos 2010, McCarthy 2015
Semnopithecus (= *"Presbytis"*°) *entellus* × *Semnopithecus* (= *"Presbytis"*°) *vetulus* **IS**
Presbytini langur group Hill 1936, Gray 1972, Chiarelli 1973, Roos 2010:
Trachypithecus × *Semnopithecus*
Semnopithecus (= *"Presbytis"*°) *entellus* × *Trachypithecus* (= *"Presbytis"*°) *obscurus*
Presbytini langur group Hill 1936, Gray 1972, Chiarelli 1973



Cercopithecidae: Two probable basic types are: Cercopithecinae and Presbytini. Hybridizations in the phylogeny of Perelman et al. 2011; the status of tribe Colobini is unclear due to unknown intergeneric hybrids (cf. Perelman et al. 2011, Fig. 1. https://doi.org/10.1371/journal.pgen.1001342, CC0)

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Primates: Hominidae 4: 8 + extinct taxa (suborder Haplorhini)

hominids = Hominiden

Real humans (true genus *Homo*)

Homo 1 (+ 5 extinct)

Basic type real humans (true genus *Homo*): The following paleoanthropological "species" of the genus *Homo* have been confirmed by molecular genetics through crossbreeding: *Homo sapiens*, Neanderthal, Denisova, *Homo heidelbergensis* (s. l.); anatomical transitions show crossbreeding with *Homo erectus* (s. l. incl. *georgicus* & *ergaster*) and *Homo floresiensis*. Fossil species such as *"Homo" habilis*, *rudolfensis*, and *naledi* have been excluded since from the genus *Homo* (see: great apes).

For the genus ***Homo*** as a real distinct basic type, see e. g.: Evolution. Ein kritisches Lehrbuch. 7. ed. 2013, p. 287–299; Scholl 2018, 2022a/b, 2023a/b/c; Brandt 2020, 2023 and Borger & Scholl 2025.

great apes (incl. false genus "*Homo*")

Gorilla 2, Pan 2, Pongo 3 (+ extinct hominin genera)

It is not yet clear if all living **great apes** belong to one, two or three basic types. All 2 *Gorilla* species are connected by hybridization, as well as the *Pan* species and *Pongo* species.

The same problem exists within **extinct great apes** (incl. **nonhuman hominins** like "*Homo*" *rudolfensis*, *habilis* and *naledi* as well as different species of *Sahelanthropus*, *Orrorin*, *Ardipithecus*, *Kenyantrophus*, *Australopithecus* and *Paranthropus*; see above). Probably fossil *Sivapithecus* (incl. *Ramapithecus*°) belongs to the same basic type as *Pongo*. For the problems concerning fossil Great Apes taxonomy: see Scholl 2022b Hybrids between gorillas and chimpanzees, known as "Bili Apes," found in the wild, turned out to be large chimpanzees (cf. Hartwig-Scherer 2005; https://en.wikipedia.org/wiki/Bili_ape 2025).

Gorilla beringei × *Gorilla gorilla* **IS** Ackermann & Bishop 2010, 272+281 (morphologically, all gorillas were classified as belonging to the same species); Lhota et al. 2022; Brummel & Wood 2023

Pan paniscus × *Pan troglodytes* **IS** (at least 3 capt. hybrids are known) Vervaecke & Van Elsacker 1992; Allen et al. 2020, Suppl. Tab. 2; Brummel & Wood 2023

Pongo abelii × *Pongo pygmaeus* **IS** Dugoujon et al. 1984; Brummel & Wood 2023; Allen et al. 2020 (fully fertile hybrids; ca. 29% of orangutans in US zoos in the 1990s were F1 hybrids; Allen et al. 2020, Suppl. Tab. 1)

Pongo abelii × *Pongo tapanuli* (new species) **IS** Banes et al. 2022; Brummel & Wood 2023

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Primates: Hylobatidae 4: 15 (suborder Haplorhini)

gibbons = Gibbons

Hoolock 2 (*hoolock, leuconedys*), *Hylobates 7* (*agilis, albibarbis, klossii, lar, moloch, muelleri, pileatus*), *Nomascus 6* (*annamensis, concolor, gabriellae, hainanus, leucogenys, nasutus, siki*), *Symphalangus 1* (*syndactylus*).

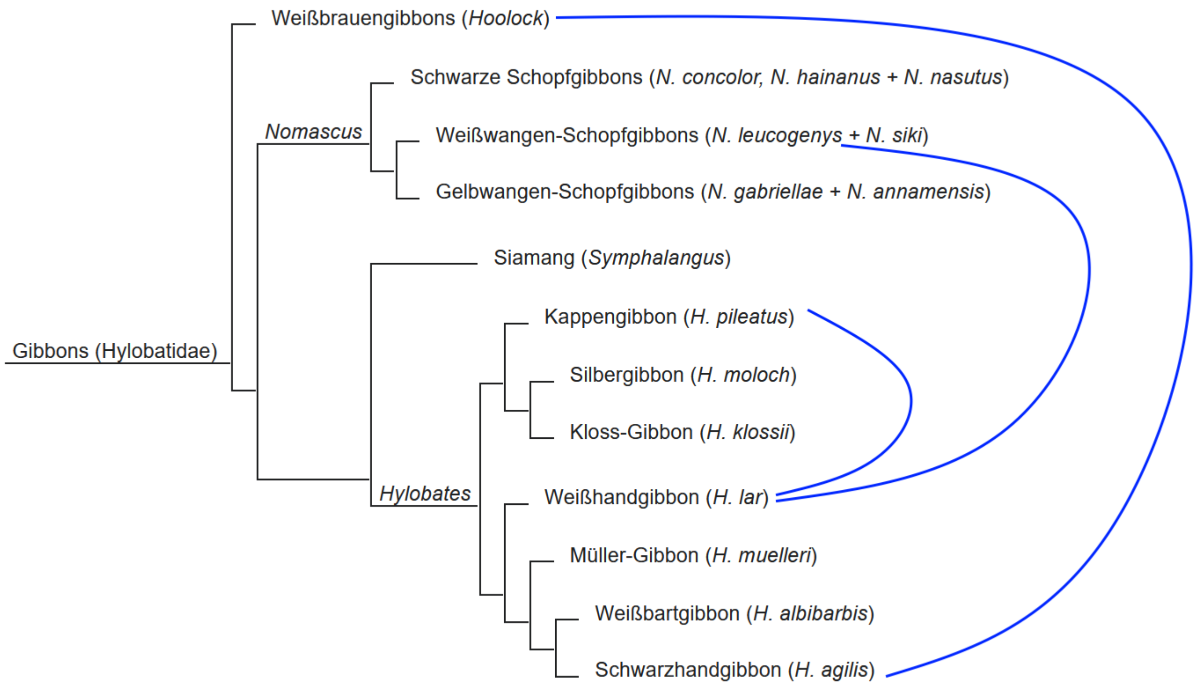
Basic type family Hylobatidae (4: 15): All 4 genera are linked by hybridization. This possibly explains why so many conflicting phylogenies of Hylobatidae exist (cf. Li et al. 2017; Roos 2016, 154; Roos lists 19 species instead of 15).

Hoolock (= Hylobates) hoolock × Hylobates agilis (fertile) Montagu 1950, Chiarelli 1973, see https://eol.org/pages/58999993

Hylobates lar × Nomascus (= Hylobates) leucogenys Hirai et al. 2007 (→ „Larcon": *Hylobates* = female), Baicharoen et al. 2010 (→ „Conlar": *Hylobates* = male), Hirai et al. 2007 (*Nomascus leucogenys* × *Hylobates lar* had 48 chromosomes (instead of 44 or 52 like the parent species), Baicharoen et al. (2014, 1+3: *Hylobates* × *Nomascus* hybrids in zoos)

Hylobates lar × *H. pileatus* **IS** Lhota et al. 2022

Hylobates moloch, muelleri × Symphalangus syndactylus (→ „Siabon") Myers & Shafer 1979, Pellicciari et al. 1988, Lhota et al. 2022, Baicharoen et al. 2014, 1+3



Hylobatidae: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Rocatti R & Perez SI 2019. nature.com/articles/s41598-019-51685-w).

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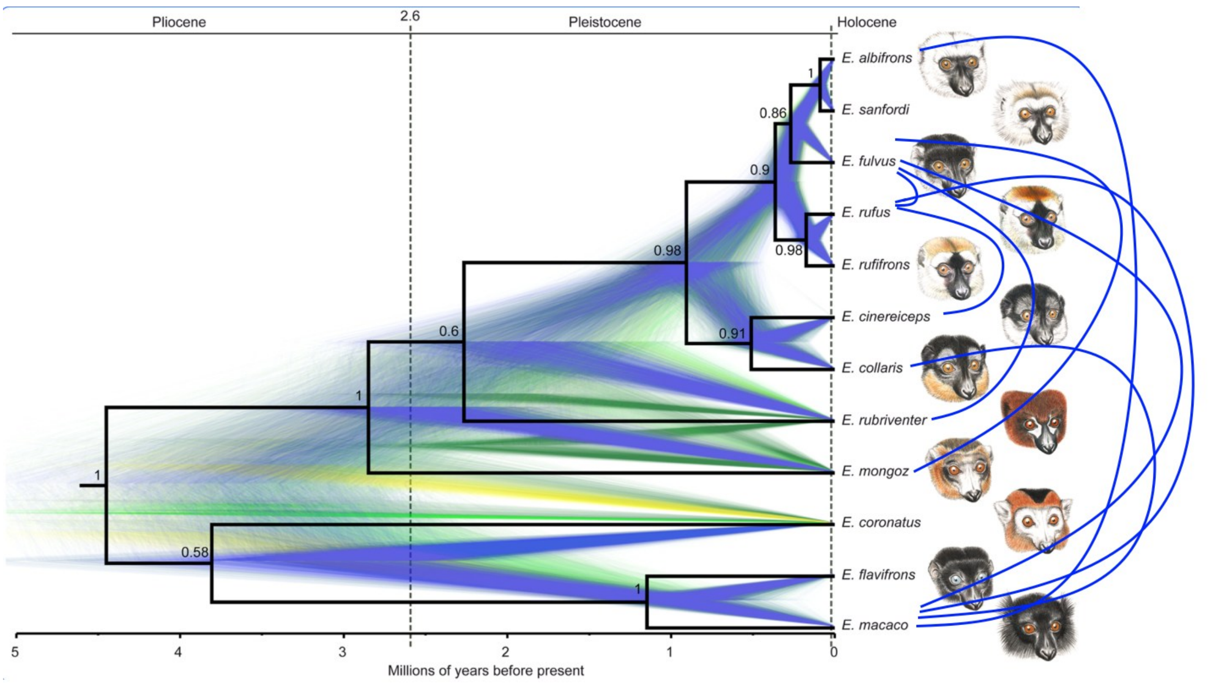
Primates: Lemuridae 4: 21 + 1 extinct genus (suborder Strepsirrhini)

lemurids = Gewöhnliche Makis

Eulemur 12, Hapalemur 6 (incl. *Prolemur sinus*), *Lemur 1 catta, Varecia 2 rubra, variegata.*

In family **Lemuridae**, at least all 12 species of genus ***Eulemur*** belong to the same **basic type**.

Eulemur rufus × *E. albocollaris (= E. cinereiceps)* **IS** Lhota et al. 2022
Eulemur mongoz × *E. fulvus* **IS** Lhota et al. 2022
Lemur m. (= Eulemur) macaco × *L. m. (= Eulemur) albifrons, L. m. colaris, L. m. rufus, L. m. fulvus* **IS** International Zoo Yearbook 1971, cf. https://www.macroevolution.net/lemur-hybrids.html
Lemur m. (= Eulemur) fulvus × *L. (= Eulemur) rubriventer, L. m. rufus* **IS** International Zoo Yearbook 1971, cf. https://www.macroevolution.net/lemur-hybrids.html
Varecia variegata × *Varecia rubra* **IS**
https://en.wikipedia.org/wiki/List_of_genetic_hybrids



Lemuridae genus *Eulemur*: Hybridization within a phylogeny according to Markolf & Kappeler (2013) (cf. © 2013 Markolf and Kappeler; licensee BioMed Central Ltd., CC BY 2.0, https://creativecommons.org/licenses/by/2.0/)

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Proboscidea 1 extant family, 2: 3, + 13 extinct families

elephants etc. = Rüsseltiere

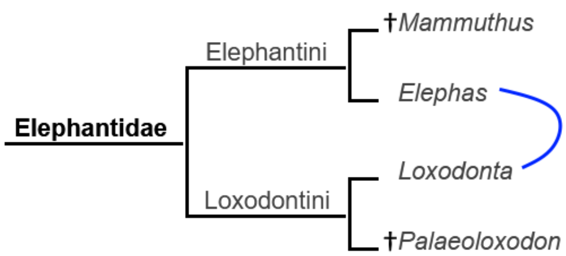
Proboscidea: Elephantidae 2: 3 + 8 extinct genera

elephants = Elefanten

Elephas, Loxodonta

Basic type family Elephantidae, at least for the extant taxa (2: 3). According to new genome data the fossil genus *Mammuthus* is closer related to *Elephas* than to *Loxodonta*, so probably **all fossil species of subfamily Elephantinae** belong to the same basic type, also (cf. Sandoval-Velasco et al. 2024, van der Valk et al. 2022, Baleka et al. 2022, Todd 2009): *Primelephas* † 2, *Elephas* 7 (1 extant + 6 extinct), *Loxodonta* 4 (2 + 2 extinct), *Mammuthus*† 10 (there are even more fossil Elephantinae: see https://en.wikipedia.org/wiki/Elephantidae 2025).

Elephas maximus × Loxodonta africana http://www.hybridelephant.com/motty.html, http://www.elephant.se/motty_die_elefanten_kreuzung.php, http://en.wikipedia.org/wiki/Motty



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Rodentia 5 suborders, 34 families,481: 2500

rodents = Nagetiere

5 suborders:

Anomaluromorpha 3 families
Castorimorpha 3 families
Hystricomorpha (incl. Caviomorpha) 17 families
Myomorpha 9 families
Sciuromorpha 3 families

Rodentia: Castoridae 1: 2 + extinct species (suborder Castorimorpha)

beavers = Biber

Probably **basic type family Castoridae** (1: 2), at least for the extant species.

Castor canadensis × *Castor fiber orientoeuropaeus* **IS** (capt. hyb., stillborn but normal large cub (33,5 cm length) with black fur) Lavrov 1996, McCarthy 2015, https://en.wikipedia.org/wiki/Eurasian_beaver 2025

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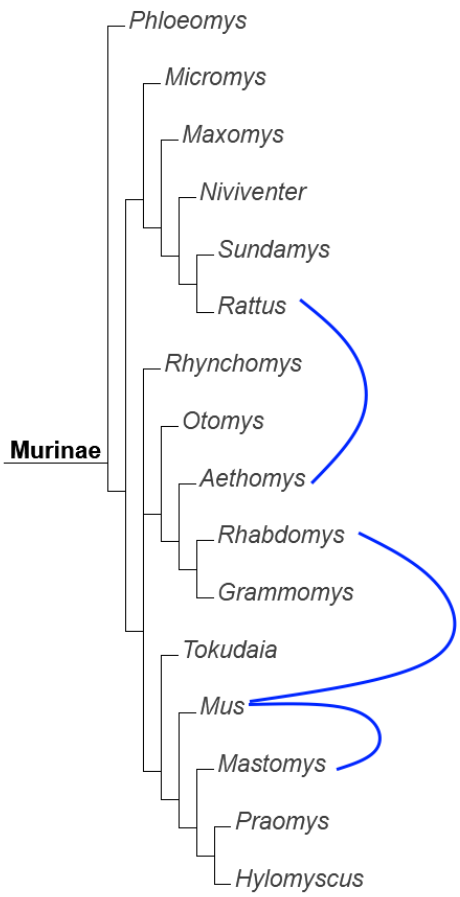
Lavrov VL (1996) Hybridisation between *Castor fiber orientoeuropaeus* Lavr. 1981 and *Castor canadensis* Kuhl, 1820. Byulleten' Moskovskogo Obshchestva Ispytatelei Prirody Otdel Biologicheskii. 1013 (vol. 3), 20–21. https://moip-bio.msu.ru/wp-content/uploads/moip_1996_101_3.pdf

Rodentia: Muridae 150: 870 (suborder Myomorpha)

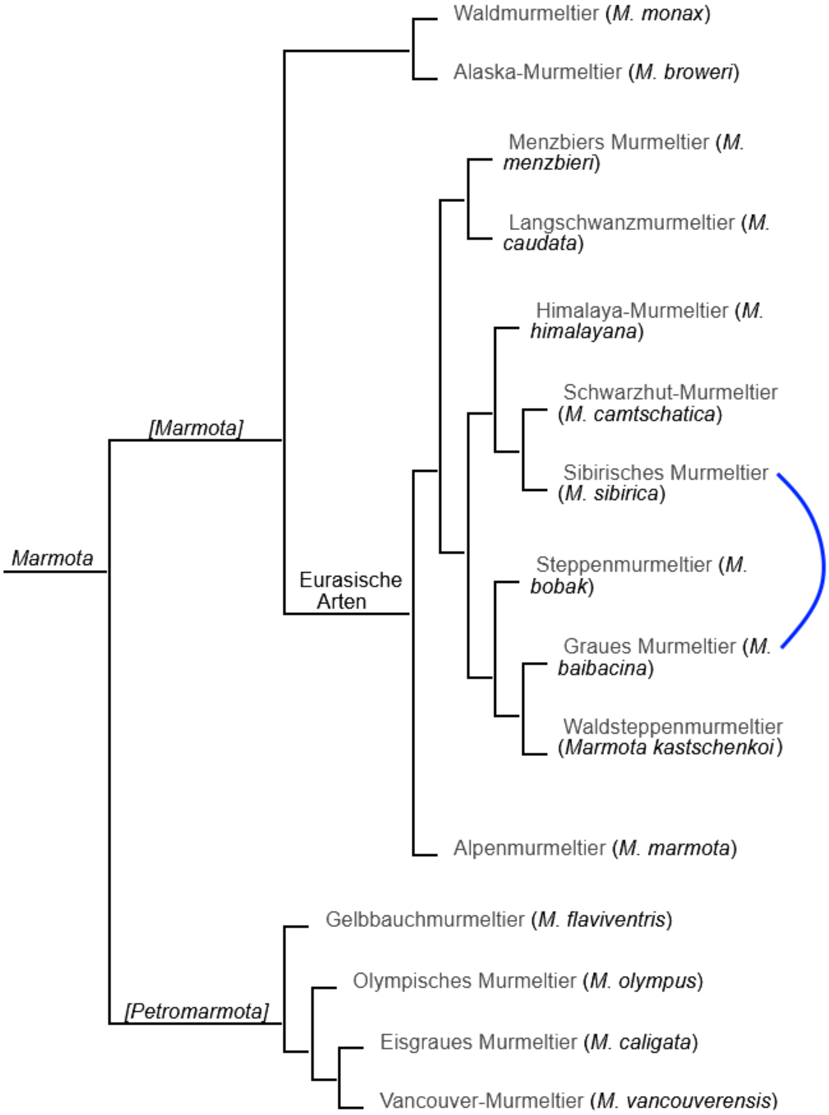
murids, true rats, true mice and gerbils = Langschwanzmäuse

5 subfamilies, e. g. Murinae 140: 519

Probable **basic type Muridae subfamily Murinae** (140: 519, + 31 extinct genera); cf. https://en.wikipedia.org/wiki/Murinae 2025). Exception in the phylogeny (but only based on 16 genera!) below is the basic genus *Phloeomys.*



Muridae subfamily Murinae: Hybridization within a phylogeny with 16 genera of Murinae according to de.wikipedia 2025, CC BY 4.0 (cf. Meyer M et al. 2017. doi:10.7554/eLife.25413)



Muridae genus *Marmota*: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Brandtler OV & Lyopunova EA 2009. https://web.archive.org/web/20160803075746/http://marmota.cons-dev.org/marm/MARM/BIBMAR/BibpdfBz/10454.pdf)

Aethomys chrysophilus × *Rattus norvegicus* Murinae Gray 1972 (art. hyb., viable), McCarthy 2015 http://www.macroevolution.net/murine-hybrids.html

Mastomys (= „*Rattus*“) *natalensis* × *Mus musculus* Murinae Gray 1972 (viable), Van Gelder 1977, McCarthy 2015

~~*Mus* × *Jaculus*~~ Muridae × Dipodidae erroneous (see McCarthy 2015)

Mus musculus × *Rhabdomys* (= *Arvicanthis*°) *pumilio* Murinae Gray 1972 (viable), McCarthy 2015

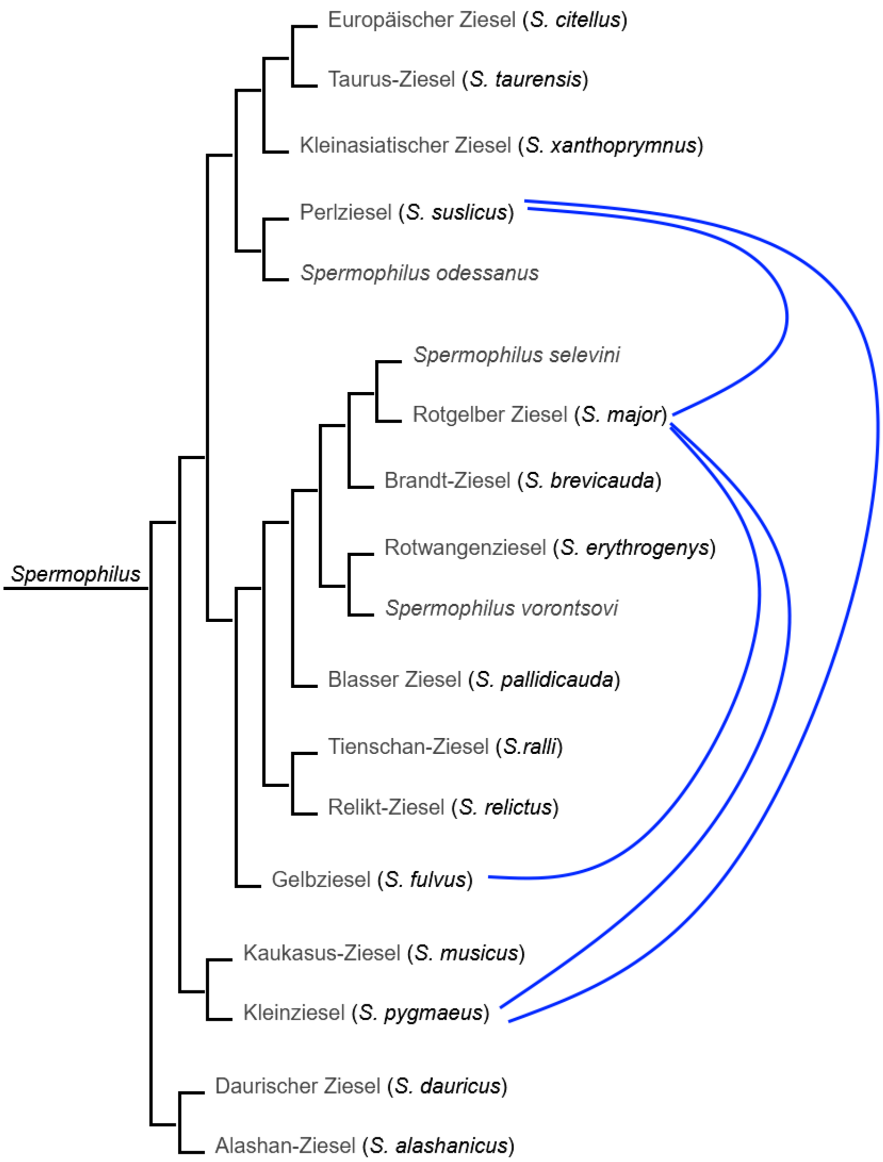
Rodentia: Sciuridae 51: 270–280 (suborder Sciuromorpha)

Squirrels = Hörnchen

Spermophilus 22, …

At least the 22 species of **genus *Spermophilus*** (1: 22) belong to the same **basic type**.

Marmota sibirica × *M. baibacina* **IS** Xerinae Kapustina et al. 2018
Spermophilus alaschanicus × *S. pallidicauda* **IS** Marmotinae Kapustina et al. 2018
Spermophilus major × *S. fulvus, S. pygmaeus, S. suslicus* **IS** Marmotinae Ermakov et al. 2002, 2006
Spermophilus pygmaeus × *S. suslicus* **IS** Marmotinae Ermakov et al. 2006



Sciuridae genus *Spermophilus*: Hybridization within a phylogeny according to de.wikipedia 2025, CC BY 4.0 (cf. Herron MD et al. 2004. doi:10.1016/j.ympev.2003.09.015)

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Sirenia 2 families, 2: 4 + 2 extinct families

sea cows, sirenians = Seekühe

2 families: Dugongidae 1: 1 (dugong), Trichedidae 1: 3 + extinct taxa (manatees)

Trichechus manatus × *T. inunguis* **IS** Trichedidae (nat. hyb.) de Oliveira et al. 2022

References:
de Oliveira EHC et al. (2022) Karyotypical confirmation of natural hybridization between two manatee species, *Trichechus manatus* and *Trichechus inunguis*. Life 12, 616. https://doi.org/10.3390/life12050616

Tubulidentata 1 family 1: 1

tubulidentates = Röhrenzähner

Tubulidentata: Orycteropodidae 1: 1 + 5 extinct genera

aardvark = Erdferkel

Orycteropus afer

Basic type family Orycteropodidae (1: 1), at least for the extant species. Anatomically well-defined (P. Klöckner, pers comm. 2008). *Orycteropus afer* is the only extant species in the whole order Tubulidentata.

Xenarthra → Cingulata and Pilosa