[Template:About](/wiki/Template:About" \o "Template:About) [Template:Automatic taxobox](/wiki/Template:Automatic_taxobox)

**Marsupials** are an [infraclass](/wiki/Class_(biology)) of [mammals](/wiki/Mammal) living primarily in [Australasia](/wiki/Australasia) and the [Americas](/wiki/Americas). A distinctive characteristic, common to many [species](/wiki/Species), is that most of the young are carried in a [pouch](/wiki/Pouch_(marsupial)). Well-known marsupials include [kangaroos](/wiki/Kangaroo), [wallabies](/wiki/Wallaby), the [koala](/wiki/Koala), [possums](/wiki/Possum), [opossums](/wiki/Opossum), [wombats](/wiki/Wombat), and the [Tasmanian devil](/wiki/Tasmanian_devil). Other marsupials include the [numbat](/wiki/Numbat), [bandicoots](/wiki/Bandicoot), [bettongs](/wiki/Bettong), the [bilby](/wiki/Macrotis), [quolls](/wiki/Quoll), and the [quokka](/wiki/Quokka).

Marsupials represent the [clade](/wiki/Clade) originating with the [last common ancestor](/wiki/Last_common_ancestor) of extant [metatherians](/wiki/Metatheria). Like other mammals in the Metatheria, they are characterized by giving birth to relatively undeveloped young, often residing in a pouch with the mother for a certain time after birth. Close to 70% of the 334 [extant](/wiki/Extant_taxon) species occur in the [Australian continent](/wiki/Australia_(continent)) (the mainland, Tasmania, [New Guinea](/wiki/New_Guinea) and nearby islands) with the remaining 100 found in the Americas, primarily in [South America](/wiki/South_America), but with thirteen in [Central America](/wiki/Central_America), and [one](/wiki/Virginia_opossum) in North America north of Mexico.

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## Taxonomy[[edit](/index.php?title=(none)&action=edit&section=1)]

[Taxonomically](/wiki/Taxonomy_(biology)), the two primary divisions of Marsupialia traditionally are: American marsupials and the Australian marsupials.<ref name=msw3a>[Template:MSW3 Gardner](/wiki/Template:MSW3_Gardner)</ref><ref name=msw3b>[Template:MSW3 Groves](/wiki/Template:MSW3_Groves)</ref> However, the order [Microbiotheria](/wiki/Microbiotheria) (which has only one species, the monito del monte) is found in South America, but is believed to be more closely related to the Australian marsupials. There are many small [arboreal](/wiki/Arboreal) species in each group. The term '[opossums'](/wiki/Opossum) is properly used to refer to the American species (though 'possum' is a common diminutive), while similar Australian species are properly called '[possums'](/wiki/Possum). Similarly, [shrew opossums](/wiki/Shrew_opossum) are more closely related to australidelphians than to true opossums.[[1]](#cite_note-1)[[2]](#cite_note-2) More recently, it has been suggested on morphological grounds that [marsupial moles](/wiki/Marsupial_moles) and [thingodonts](/wiki/Thingodonta) are actually not marsupials at all, but surviving [dryolestoids](/wiki/Dryolestoidea).[[3]](#cite_note-3) Retroposon insertion site data places marsupial moles within [Euaustralidelphia](/wiki/Australidelphia),[[2]](#cite_note-2) but problems with the sample, as well as inconsistent data, have rendered this assessment problematic.[[4]](#cite_note-4) †Extinct

* Order [Didelphimorphia](/wiki/Didelphimorphia) (93 species)
  + - Family [Didelphidae](/wiki/Didelphidae): opossums
* Order [Paucituberculata](/wiki/Paucituberculata) (seven species)
  + - Family [Caenolestidae](/wiki/Caenolestidae): [shrew opossums](/wiki/Shrew_opossum)
* Superorder [Australidelphia](/wiki/Australidelphia)
  + Order [Microbiotheria](/wiki/Microbiotheria) (one species)
    - Family [Microbiotheriidae](/wiki/Microbiotheriidae): [monito del monte](/wiki/Monito_del_monte)
  + ?Order †[Yalkaparidontia](/wiki/Yalkaparidontia)
  + Order [Dasyuromorphia](/wiki/Dasyuromorphia) (75 species)
    - Family †[Thylacinidae](/wiki/Thylacinidae): [thylacine](/wiki/Thylacine)
    - Family [Dasyuridae](/wiki/Dasyuridae): [antechinuses](/wiki/Antechinus), [quolls](/wiki/Quoll), [dunnarts](/wiki/Dunnart), [Tasmanian devil](/wiki/Tasmanian_devil), and relatives
    - Family [Myrmecobiidae](/wiki/Myrmecobiidae): [numbat](/wiki/Numbat)
  + Order [Peramelemorphia](/wiki/Peramelemorphia) (24 species)
    - Family [Thylacomyidae](/wiki/Thylacomyidae): [bilbies](/wiki/Bilby)
    - Family †Chaeropodidae: [pig-footed bandicoot](/wiki/Pig-footed_bandicoot)
    - Family [Peramelidae](/wiki/Peramelidae): [bandicoots](/wiki/Bandicoot) and allies
  + ?Order [Notoryctemorphia](/wiki/Notoryctemorphia) (two species)
    - ?Family [Notoryctidae](/wiki/Notoryctidae): [marsupial moles](/wiki/Marsupial_mole)
  + Order [Diprotodontia](/wiki/Diprotodontia) (137 species)
    - Family [Phascolarctidae](/wiki/Phascolarctidae): [koalas](/wiki/Koala)
    - Family [Vombatidae](/wiki/Vombatidae): [wombats](/wiki/Wombat)
    - Family †[Diprotodontidae](/wiki/Diprotodontidae): [diprotodon](/wiki/Diprotodon)
    - Family [Phalangeridae](/wiki/Phalangeridae): [brushtail possums](/wiki/Brushtail_possum) and [cuscuses](/wiki/Cuscus)
    - Family [Burramyidae](/wiki/Burramyidae): [pygmy possums](/wiki/Pygmy_possum)
    - Family [Tarsipedidae](/wiki/Tarsipedidae): [honey possum](/wiki/Honey_possum)
    - Family [Petauridae](/wiki/Petauridae): [striped possum](/wiki/Striped_possum), [Leadbeater's possum](/wiki/Leadbeater's_possum), [yellow-bellied glider](/wiki/Yellow-bellied_glider), [sugar glider](/wiki/Sugar_glider), [mahogany glider](/wiki/Mahogany_glider), [squirrel glider](/wiki/Squirrel_glider)
    - Family [Pseudocheiridae](/wiki/Pseudocheiridae): [ringtailed possums](/wiki/Common_ringtail_possum) and relatives
    - Family [Potoroidae](/wiki/Potoroidae): [potoroos](/wiki/Potoroo), rat kangaroos, [bettongs](/wiki/Bettong)
    - Family [Acrobatidae](/wiki/Acrobatidae): [feathertail glider](/wiki/Feathertail_glider) and [feather-tailed possum](/wiki/Feather-tailed_possum)
    - Family [Hypsiprymnodontidae](/wiki/Hypsiprymnodontidae): [musky rat-kangaroo](/wiki/Musky_rat-kangaroo)
    - Family [Macropodidae](/wiki/Macropodidae): [kangaroos](/wiki/Kangaroo), [wallabies](/wiki/Wallaby), and relatives
    - Family †[Thylacoleonidae](/wiki/Thylacoleonidae): [marsupial lions](/wiki/Marsupial_lion)

[Template:Clade](/wiki/Template:Clade)

[Cladogram](/wiki/Cladogram) based on Gallus, S. *et al*. (2015)[[5]](#cite_note-5)

## Anatomy[[edit](/index.php?title=(none)&action=edit&section=2)]

[thumb|](/wiki/File:Koala_climbing_tree.jpg)[Koala](/wiki/Koala)   
(*Phascolarctos cinereus*)

In addition to the front [pouch](/wiki/Pouch_(marsupial)), which contains multiple nipples for protection and sustenance of the young, marsupials have several other common structural features. [Ossified](/wiki/Ossification) [patellae](/wiki/Patella) are absent in most modern marsupials, though a small number of exceptions are reported [Template:Citation needed](/wiki/Template:Citation_needed) and [epipubic bones](/wiki/Epipubic_bones) are present. Marsupials (and also [monotremes](/wiki/Monotreme)) also lack a gross communication ([corpus callosum](/wiki/Corpus_callosum)) between the right and left brain hemispheres.[[6]](#cite_note-6) Marsupials have the typical characteristics of [mammals](/wiki/Mammal), like a fur coat. There are, however, striking differences in addition to a number anatomical features that separate them from the higher mammals (Eutheria).

### Description[[edit](/index.php?title=(none)&action=edit&section=3)]

[Template:Multiple issues](/wiki/Template:Multiple_issues)

#### Skull and teeth[[edit](/index.php?title=(none)&action=edit&section=4)]

The construction of the skull has some peculiarities in comparison to higher mammals. In general, the skull is relatively small and tight. There are holes (*foramen lacrimale*) located in the front of the orbit, the cheekbone is enlarged and extends further to the rear, and the angular extension (*processus angularis*) of the lower jaw is bent toward the center. Another feature is the hard palate, which always, in contrast to the higher mammals' foramina, have more openings. Also, the teeth of these animals differ in some respects from that of placental mammals, so that all taxa, except [wombats](/wiki/Wombat), have a different number of incisors in the upper and lower jaws. The early marsupials had a dental formula from 5 / 4-1 / 1-3 / 3-4 / 4, that is, per pine half; they have five maxilla or four mandibular incisors, one canine, three premolars and four molars, for a total of 50 teeth. Some taxa, such as the [opossum](/wiki/Opossum), still have the original number of teeth, in other groups it has come, nutritionally, to the reduction in the number of teeth. Even today, marsupials in many cases have 40 to 50 teeth, which is significantly more in comparison to placental mammals. There is a high number of incisors in the upper jaw, up to ten, and they have more molars than premolars. The second set of teeth grows in only at the 3rd premolar, all the remaining teeth are already created as permanent teeth.

#### Torso[[edit](/index.php?title=(none)&action=edit&section=5)]

There are few general characteristics in their skeleton. In addition to details in the construction of the ankle, there are, for these animals especially, the marsupial bones (*Ossa epubica*) characteristic, two from the pubic bone of the pelvis, a forwardly projecting bone. Since these are also present in males and pouchless species, it is believed that these bones had originally nothing to do with reproduction, but served in the muscular approach to the movement of the hind limbs. Since the egg-laying [platypus](/wiki/Platypus) have marsupial bones, it is believed that it could be explained by an original feature of mammal. In construction of the reproductive organs, the marsupials differ also from the higher mammals. For them, the reproductive tract is doubled. The females have two uteri and two vaginas, and before birth, a birth canal forms between them, the pseudo-vagina. The males have a split or double penis with lying in front of the scrotum.

A pouch is present in several species, but by no means present in all species. Some marsupials have a permanent bag, whereas in others it only develops during the gestation period, as with the [shrew opossum](/wiki/Shrew_opossum), where the young are hidden only by skin folds or in the fur of the mother. The arrangement of the pouch is variable to allow the offspring to be dependent on maximum protection. The locomotive kangaroos have a pouch opening at the front, while many others that walk or climb on all fours have the opening in the back. Usually, only females have a pouch, but the male [water opossum](/wiki/Water_opossum) also has a pouch that is used to accommodate offspring therein the scrotum while swimming or running.

#### General and convergences[[edit](/index.php?title=(none)&action=edit&section=6)]

[Template:Multiple image](/wiki/Template:Multiple_image) Marsupials have adapted to a wide variety of habitats, which is reflected in the wide variety in their build. The largest living marsupial, the [red kangaroo](/wiki/Red_kangaroo), grows up to [Template:Convert](/wiki/Template:Convert) in height and [Template:Convert](/wiki/Template:Convert) in weight, but extinct genera, such as [Diprotodon](/wiki/Diprotodon), were significantly larger and heavier. The smallest members of this group are the [marsupial mice](/wiki/Marsupial_mice), which often reach only [Template:Convert](/wiki/Template:Convert) in body length.

Some species show many similarities to higher mammals and constitute as examples of [convergent evolution](/wiki/Convergent_evolution). The extinct [*Thylacine*](/wiki/Thylacine) strongly resembled the placental wolf, hence its nickname "Tasmanian wolf". Flying and the associated ability to glide has occurred both with marsupials (as with [sugar gliders](/wiki/Sugar_glider)) and some higher mammals (as with [flying squirrels](/wiki/Flying_squirrel)), which developed independently. Other groups such as the kangaroo, however, do not have placental counterparts.

### {{anchor|Reproductive\_System}}Reproductive system[[edit](/index.php?title=(none)&action=edit&section=7)]

[Template:See also](/wiki/Template:See_also)

[thumb|150px|Female](/wiki/File:Kangaroo_and_joey03.jpg) [eastern grey kangaroo](/wiki/Eastern_grey_kangaroo) with a [joey](/wiki/Joey_(marsupial)) in her pouch Marsupials' reproductive systems differ markedly from [those of placental mammals](/wiki/Mammalian_reproductive_system).[[7]](#cite_note-7)<ref name=DaMR/> The female develops a kind of [yolk sac](/wiki/Yolk_sac) in her womb which delivers nutrients to the [embryo](/wiki/Embryo). Embryos of some marsupials additionally form [placenta](/wiki/Placenta)-like organs that connect them to the [uterine](/wiki/Uterus) wall, although it is not certain that they transfer nutrients from the mother to the embryo.[[8]](#cite_note-8) Pregnancy is very short, typically 4 to 5 weeks, and the embryo is born at a very young stage of development.[Template:Citation needed](/wiki/Template:Citation_needed)

The evolution of reproduction in marsupials, and speculation about the ancestral state of [mammalian reproduction](/wiki/Mammalian_reproduction), have engaged discussion since the end of the 19th century. Both sexes possess a [cloaca](/wiki/Cloaca),<ref name=DaMR/> which is connected to a urogenital sac used to store waste before expulsion. The [bladder](/wiki/Urinary_bladder) of marsupials functions as a site to concentrate urine and empties into the common urogenital sinus in both females and males.<ref name=DaMR/>

[Template:Anchor](/wiki/Template:Anchor)

#### {{anchor|Male}}Male reproductive system[[edit](/index.php?title=(none)&action=edit&section=8)]

Most male marsupials, except for [macropods](/wiki/Macropodidae)[[9]](#cite_note-9) and [marsupial moles](/wiki/Marsupial_mole),[[10]](#cite_note-10) have a bifurcated penis, separated into two columns, so that the penis has two ends corresponding to the females' two vaginas.[[6]](#cite_note-6)<ref name=DaMR>[Template:Cite web](/wiki/Template:Cite_web)</ref>[[11]](#cite_note-11)[[12]](#cite_note-12)[[13]](#cite_note-13)<ref name=Rodger&Hughes1973>[Template:Cite journal](/wiki/Template:Cite_journal)</ref><ref name=SharmanPilton1964>[Template:Cite journal](/wiki/Template:Cite_journal)</ref><ref name=Sadleir1965>[Template:Cite journal](/wiki/Template:Cite_journal)</ref>[[14]](#cite_note-14) The penis is used only for [inseminating](/wiki/Inseminating) females, and is separate from the [urinary tract](/wiki/Urinary_tract).[[15]](#cite_note-15) It curves forward when erect,[[16]](#cite_note-16) and when not erect, it is retracted into the body in an S-shaped curve.[[13]](#cite_note-13) Neither marsupials nor monotremes possess a [baculum](/wiki/Baculum).[[6]](#cite_note-6) The shape of the [glans penis](/wiki/Glans_penis) varies among marsupial species.[[13]](#cite_note-13)[[17]](#cite_note-17)[[18]](#cite_note-18)[[19]](#cite_note-19) A male koala's [foreskin](/wiki/Penile_sheath) contains naturally occurring bacteria that play an important role in fertilization.[[20]](#cite_note-20) The male [thylacine](/wiki/Thylacine) had a pouch that acted as a protective sheath, covering his external reproductive organs while he ran through thick brush.[[21]](#cite_note-21) The shape of the urethral grooves of the males' genitalia is used to distinguish between [*Monodelphis brevicaudata*](/wiki/Monodelphis_brevicaudata), [*Monodelphis domestica*](/wiki/Monodelphis_domestica), and [*Monodelphis americana*](/wiki/Monodelphis_americana). The grooves form 2 separate channels that form the ventral and dorsal folds of the erectile tissue.[[22]](#cite_note-22) The prostate is proportionally larger in marsupials than in placental mammals.[[13]](#cite_note-13) During the breeding season, the male [tammar wallaby's](/wiki/Tammar_wallaby) prostate and [bulbourethral gland](/wiki/Bulbourethral_gland) enlarge. However, there does not appear to be any seasonal difference in the weight of the testes.<ref name=Inns1982>[Template:Cite journal](/wiki/Template:Cite_journal)</ref>

#### {{anchor|Female}}Female reproductive system[[edit](/index.php?title=(none)&action=edit&section=9)]

[Template:See also](/wiki/Template:See_also) [thumb|300px|Female reproductive anatomy of several marsupial species](/wiki/File:Cambridge_Natural_History_Mammalia_Fig_048.png) Female marsupials have two lateral [vaginas](/wiki/Vagina), which lead to separate [uteri](/wiki/Uteri), but both open externally through the same orifice. A third canal, the median vagina, is used for birth. This canal can be transitory or permanent.[[6]](#cite_note-6) The definitive placenta in all marsupials is generated by the yolk sac.[[23]](#cite_note-23) Among three fetal membranes in mammals, the [yolk sac](/wiki/Yolk_sac), [allantois](/wiki/Allantois), and [amnion](/wiki/Amnion), only the first two form a placenta.<ref name=FreyerRenfree2009>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> The evolution of placentation in vertebrates is linked to the evolution of [viviparity](/wiki/Viviparity), a reproductive system in which the females retain their eggs to give birth to their young. Marsupials give birth at a very early stage of development (about four to five weeks); after birth, newborn marsupials crawl up the bodies of their mothers and attach themselves to a nipple, which is located on the underside of the mother either inside a pouch called the [marsupium](/wiki/Pouch_(marsupial)) or open to the environment. To crawl to the nipple and attach to it, the marsupial must have well-developed forelimbs and facial structures.[[24]](#cite_note-24)[[25]](#cite_note-25) This is accomplished by accelerating forelimb and facial development in marsupials compared to placental mammals, which results in decelerated development of such structures as the hindlimb and brain. There they remain for a number of weeks, attached to the nipple. The offspring are eventually able to leave the marsupium for short periods, returning to it for warmth, protection, and nourishment.

##### Early development[[edit](/index.php?title=(none)&action=edit&section=10)]

An early birth removes a developing marsupial from its mother's body much sooner than in placental mammals, thus marsupials have not developed a complex [placenta](/wiki/Placenta) to protect the [embryo](/wiki/Embryo) from its mother's [immune system](/wiki/Immune_system). Though early birth puts the tiny newborn marsupial at a greater environmental risk, it significantly reduces the dangers associated with long pregnancies, as there is no need to carry a large fetus to full-term in bad seasons. Marsupials are extremely [altricial](/wiki/Altricial) animals, needing to be intensely cared for immediately following birth ([cf.](/wiki/Cf.) [precocial](/wiki/Precocial)).

Because newborn marsupials must climb up to their mother's nipples, their front limbs are much more developed than the rest of their bodies at the time of birth. This requirement has been argued to have resulted in the limited range of locomotor adaptations in marsupials compared to placentals. Marsupials must develop grasping forepaws during their early youth, making the transition from these limbs into [hooves](/wiki/Hoof), [wings](/wiki/Wing), or [flippers](/wiki/Flipper_(anatomy)), as some groups of placental mammals have done, far more difficult. However, several marsupials do possess atypical forelimb morphologies, such as the hooved forelimbs of the [pig-footed bandicoot](/wiki/Pig-footed_bandicoot), suggesting that the range of forelimb speciation is a lot less limited than usually assumed.[[26]](#cite_note-26) An infant marsupial is known as a **joey**. Marsupials have a very short [gestation](/wiki/Gestation) period (about four to five weeks), and the joey is born in an essentially [fetal](/wiki/Fetus) state. The blind, furless, miniature newborn, the size of a [jelly bean](/wiki/Jelly_bean),[[27]](#cite_note-27) crawls across its mother's fur to make its way into the [pouch](/wiki/Pouch_(marsupial)), where it latches onto a [teat](/wiki/Teat) for food. It will not re-emerge for several months, during which time it develops fully. After this period, the joey begins to spend increasing lengths of time out of the pouch, feeding and learning survival skills. However, it returns to the pouch to sleep, and if danger threatens, it will seek refuge in its mother's pouch for safety.

Joeys stay in the pouch for up to a year in some species, or until the next joey is born. A marsupial joey is unable to regulate its own body temperature and relies upon an external heat source. Until the joey is well-furred and old enough to leave the pouch, a pouch temperature of [Template:Convert](/wiki/Template:Convert) must be constantly maintained.

## Evolution[[edit](/index.php?title=(none)&action=edit&section=11)]

[Template:See also](/wiki/Template:See_also) [thumb|left|170px|upright|Isolated](/wiki/File:Djarthia_murgonensis.jpg) [petrosals](/wiki/Petrous_part_of_the_temporal_bone) of [*Djarthia murgonensis*](/wiki/Djarthia_murgonensis), Australia's oldest marsupial fossils[[28]](#cite_note-28) [170 px|left|thumb|Dentition of the herbivorous eastern grey kangaroo, as illustrated in Knight's *Sketches in Natural History*](/wiki/File:Animaldentition_macropusgiganteus.png) The relationships among the three extant divisions of mammals ([monotremes](/wiki/Monotreme), marsupials, and [placentals](/wiki/Placental_mammal)) were long a matter of debate among [taxonomists](/wiki/Taxonomy_(biology)).[[29]](#cite_note-29) Most [morphological](/wiki/Morphology_(biology)) evidence comparing traits such as [number and arrangement of teeth](/wiki/Dentition) and structure of the [reproductive and waste elimination systems](/wiki/Genitourinary_system) as well as most [genetic and molecular](/wiki/Molecular_genetics) evidence favors a closer evolutionary relationship between the marsupials and placental mammals than either has with the monotremes.[[30]](#cite_note-30) [thumb|](/wiki/File:Phylogenetic_tree_of_marsupials_derived_from_retroposon_data_-_journal.pbio.1000436.g002.png)[Phylogenetic tree](/wiki/Phylogenetic_tree) of marsupials derived from [retroposon](/wiki/Retroposon) data[[2]](#cite_note-2) The ancestors of marsupials, part of a larger group called [metatherians](/wiki/Metatheria), probably split from those of placental mammals ([eutherians](/wiki/Eutheria)) during the mid-[Jurassic](/wiki/Jurassic) period, though no fossil evidence of metatherians themselves are known from this time.<ref name=Juramaia>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> Fossil metatherians are distinguished from eutherians by the form of their teeth; metatherians possess four pairs of [molar teeth](/wiki/Molar_tooth) in each jaw, whereas eutherian mammals (including true placentals) never have more than three pairs.<ref name=VertPal>[Template:Cite book](/wiki/Template:Cite_book)</ref> Using this criterion, the earliest known metatherian is [*Sinodelphys szalayi*](/wiki/Sinodelphys), which lived in China around 125 million years ago (mya).[[31]](#cite_note-31) This makes it a contemporary to some early eutherian species which have been found in the same area.[[32]](#cite_note-32) The oldest metatherian fossils are found in present-day China.[[33]](#cite_note-33) About 100 mya, the supercontinent [Pangaea](/wiki/Pangaea) was in the process of splitting into the northern continent [Laurasia](/wiki/Laurasia) and the southern continent [Gondwana](/wiki/Gondwana), with what would become China and Australia already separated by the [Tethys Ocean](/wiki/Tethys_Ocean). From there, metatherians spread westward into modern North America (still attached to Eurasia), where the earliest true marsupials are found. Marsupials are difficult to distinguish from other fossils, as they are characterized by aspects of the reproductive system which do not normally fossilize (including pouches) and by subtle changes in the bone and tooth structure that show a metatherian is part of the marsupial [crown group](/wiki/Crown_group) (the most exclusive group that contains all living marsupials). The earliest definite marsupial fossil belongs to the species [*Peradectes minor*](/wiki/Peradectes_minor), from the [Paleocene](/wiki/Paleocene) of [Montana](/wiki/Montana), dated to about 65 million years ago.[[34]](#cite_note-34) From their point of origin in Laurasia, marsupials spread to South America, which was connected to North America until around 65 mya. Laurasian marsupials eventually died off, for not entirely clear reasons; convention has it that they disappeared due to competition with placentals, but this is no longer accepted to be the primary reason.[[35]](#cite_note-35) In South America, the [opossums](/wiki/Didelphimorphia) evolved and developed a strong presence, and the [Paleogene](/wiki/Paleogene) also saw the evolution of [shrew opossums](/wiki/Shrew_opossum) (Paucituberculata) alongside non-marsupial metatherian predators such as the [borhyaenids](/wiki/Borhyaenidae) and the saber-toothed [*Thylacosmilus*](/wiki/Thylacosmilus). South American niches for mammalian carnivores were dominated by these marsupial and [sparassodont](/wiki/Sparassodonta) metatherians. While placental predators were absent, the metatherians did have to contend with avian ([terror bird](/wiki/Phorusrhacidae)) and terrestrial crocodylomorph competition. South America and [Antarctica](/wiki/Antarctica) remained connected until 35 mya, as shown by the unique fossils found there. North and South America were disconnected until about three million years ago, when the [Isthmus of Panama](/wiki/Isthmus_of_Panama) formed. This led to the [Great American Interchange](/wiki/Great_American_Interchange). Sparassodonts disappeared for unclear reasons – again, this has classically assumed as competition from carnivoran placentals, but the last sparassodonts co-existed with a few small carnivorans like [procyonids](/wiki/Procyonidae) and canines, and disappeared long before the arrival of macropredatory forms like felines,[[36]](#cite_note-36) while didelphimorphs (opossums) invaded Central America, with the [Virginia opossum](/wiki/Virginia_opossum) reaching as far north as Canada.

Marsupials reached Australia via Antarctica about 50 mya, shortly after Australia had split off. This suggests a single dispersion event of just one species, most likely a relative to South America's [monito del monte](/wiki/Monito_del_monte) (a [microbiothere](/wiki/Microbiotheria), the only New World [australidelphian](/wiki/Australidelphia)). This progenitor may have [rafted](/wiki/Oceanic_dispersal) across the widening, but still narrow, gap between Australia and Antarctica. In Australia, they radiated into the wide variety seen today. Modern marsupials appear to have reached the islands of [Borneo](/wiki/Borneo) and [Sulawesi](/wiki/Sulawesi) relatively recently via Australia.[[37]](#cite_note-37)[[38]](#cite_note-38)[[39]](#cite_note-39) A 2010 analysis of [retroposon](/wiki/Retroposon) [insertion sites](/wiki/Retrotransposon_marker) in the [nuclear DNA](/wiki/Nuclear_DNA) of a variety of marsupials has confirmed all living marsupials have South American ancestors. The branching sequence of marsupial orders indicated by the study puts Didelphimorphia in the most [basal](/wiki/Basal_(phylogenetics)) position, followed by Paucituberculata, then Microbiotheria, and ending with the radiation of Australian marsupials. This indicates that Australidelphia arose in South America, and reached Australia after Microbiotheria split off.[[1]](#cite_note-1)[[2]](#cite_note-2) In Australia, terrestrial placental mammals disappeared early in the [Cenozoic](/wiki/Cenozoic) (their most recent known fossils being 55 million-year-old teeth resembling those of [condylarths](/wiki/Condylarth)) for reasons that are not clear, allowing marsupials to dominate the Australian ecosystem.[[37]](#cite_note-37) Extant native Australian terrestrial placental mammals (such as [hopping mice](/wiki/Hopping_mouse)) are relatively recent immigrants, arriving via island hopping from Southeast Asia.[[38]](#cite_note-38) Genetic analysis suggests a divergence date between the marsupials and the placentals at [Template:Ma](/wiki/Template:Ma).<ref name=Graves2013>Graves JA, Renfree MB (2013) Marsupials in the age of genomics. *Annu Rev Genomics Hum Genet*</ref> The ancestral number of chromosomes has been estimated to be 2n = 14.

A new hypothesis suggests that South American microbiotheres resulted from a back-dispersal from eastern Gondwana due to new cranial and post-cranial marsupial fossils from the *Djarthia murgonensis* from the early Eocene Tingamarra Local Fauna in Australia that indicate the *Djarthia murgonensis* is the most plesiomorphic, the oldest unequivocal australidelphian, and may be the ancestral morphotype of the Australian marsupial radiation.[[40]](#cite_note-40) [Template:Evolution of Marsupials](/wiki/Template:Evolution_of_Marsupials)

## See also[[edit](/index.php?title=(none)&action=edit&section=12)]

[Template:Commons category](/wiki/Template:Commons_category)

* [Marsupial lawn](/wiki/Marsupial_lawn)
* [Metatheria](/wiki/Metatheria)

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## References[[edit](/index.php?title=(none)&action=edit&section=13)]

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## Further reading[[edit](/index.php?title=(none)&action=edit&section=14)]

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* [Template:Cite journal](/wiki/Template:Cite_journal)
* [Template:BibISBN](/wiki/Template:BibISBN)

## External links[[edit](/index.php?title=(none)&action=edit&section=15)]

[Template:Sister project links](/wiki/Template:Sister_project_links)

* [Western Australian Mammal Species](http://members.iinet.net.au/~foconnor/mammals/mammals.htm)
* [Researchers Publish First Marsupial Genome Sequence](http://www.genome.gov/25521146) The National Institutes of Health May 2007
* [First marsupial genome released. Most differences between the opossom and placental mammals stem from non-coding DNA](http://www.the-scientist.com/news/home/53187/)

[Template:Mammals](/wiki/Template:Mammals) [Template:Portal bar](/wiki/Template:Portal_bar)

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