

MARSUPIALIA

Introduction

The Order Marsupialia is currently composed of sixteen families representing approximately 280 species in 57 genera. Some taxonomists have proposed creating a super-order, Marsupialia, with 2 or 3 orders under it as a better way of classifying this very diverse group of animals. The following table is a break down of the current families in the order Marsupialia according to Walker (1991). Other taxonomist such as Grzimek (1990) & Macdonald (1984) place the ring-tailed possums and “rat”-kangaroos in the families (Pseudocheiridae and Potoroidae respectively).

FAMILY	COMMON NAME	SPECIES
Didelphidae	American opossums	77
Caeolestidae	Shrew opossums	7
Microbiotheriidae	Monito del Monte	1
Thylacinidae	Tasmanian wolf	1
Dasyuridae	Marsupial ‘mice & cat’ / Tasmanian devil	58
Myrmecobiidae	Numbat / Banded anteater	1
Peramelidae	bandicoots	21
Thylacomyidae	Rabbit-eared bandicoots (Bilbies)	2
Notoryctidae	Marsupial mole	1
Phascolarctidae	Koala	1
Vombatidae	wombats	3
Plalangeridae	Brushtail possums and cuscuses	20
Petauridae	gliding, ring-tailed & striped possums	23
Burramyidae	pygmy possums	7
Macropodidae	wallabies and kangaroos	56
Tarsipedidae	Honey possum	1

Marsupials are named for the marsupium, or pouch, where the young develop after birth. Marsupials occupy many niches, but have a very limited geographic range. The Didelphidae and Caeolestidae found in the Americas are the only living examples of marsupials outside Australia and New Guinea.

Evolution

Marsupials may have originated in the New World (NA) during the Mesozoic Era (130 mya) when the continents were still connected. Early marsupials may have moved southward into South America and then into Australia. (This is based on fossil remains; other routes may have existed but have yet to be supported by fossils). Did placental mammals drive marsupials to the ‘ends of the world’ or did they also enter Australia and for some reason unable to survive. In any event marsupials filled niches in Australia that are occupied by placental mammals in the rest of the world.

Physical and Behavioral Adaptations

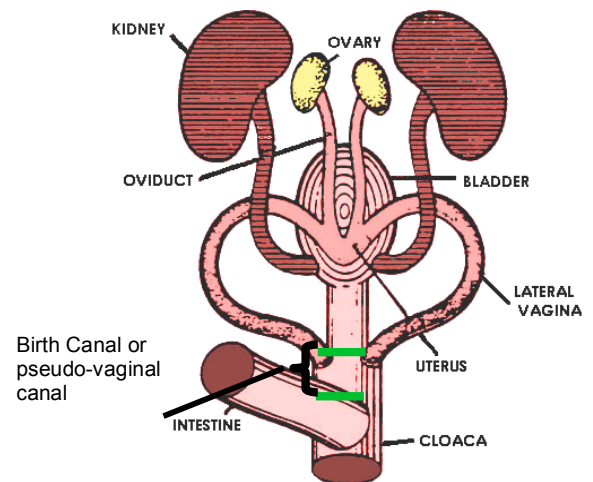
The primary characteristic defining the order is the unique reproductive system in that they lack a true placenta. Since marsupials occupy many niches, each family has developed unique adaptations for its different lifestyle.

Most grazing animals have teeth with open roots so they can continue to grow as the animal ages. However kangaroo roots are closed so they have an entirely different system for replacement. There are four pairs of cheek teeth on either side of the jaws, only the front ones engage. As they are worn down to the roots, they fall out and those from the rear migrate forward to take their place. By the time the animal is 15 or 20 years old its last molars are in use. Eventually these too will be worn down and shed so that even if the animal does not die for any other reason, it will eventually die from starvation.

In high temperatures they often lick their arms, chest and legs using the evaporating saliva to cool the body.

Reproductive Physiology / Courtship and Young

Marsupials lack a true placenta. Female marsupials have dual reproductive systems (see diagram). The young are born in a minimally developed state after a brief gestation period. (Growing time in the marsupial actually exceeds the gestation period). At birth only the clawed forelimbs, tactile sense, olfactory sense, and static sense (anti-gravity reflex that allows them to know which way is up) are well developed. The newborns climb from their mother's vulva to the marsupium and attach themselves to a teat. At this point they are too undeveloped to suckle thus the teat swell to lock into place and milk is "injected" in the joey. The young are usually born through a birth canal that forms prior to each birth (i.e. American opossum while in kangaroos this canal becomes permanent after the first birth).



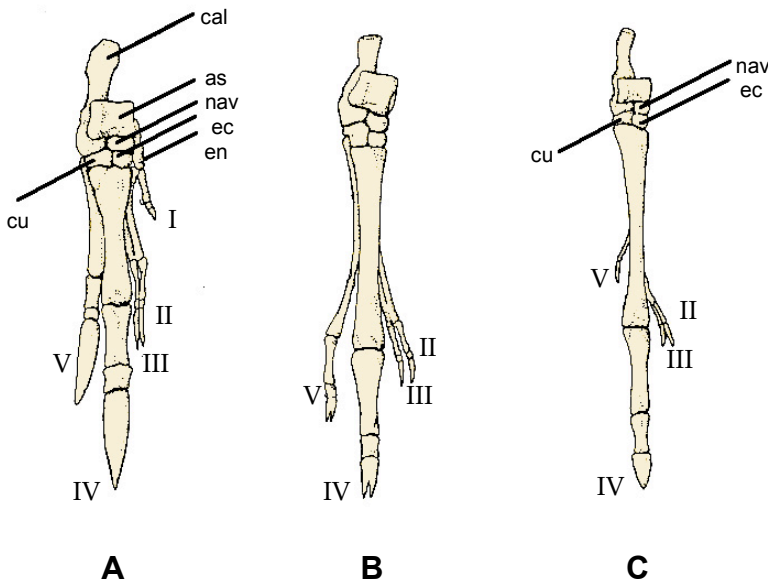
Several kangaroo, Wallaroo and wallaby species also exhibit embryonic diapause: the female mate shortly after giving birth and the fertilized embryo develops into a blastocyst of 85 - 100 cells, and then becomes dormant. While the female is nursing an offspring (joey) in the pouch, the blastocyst remains dormant. When the joey stops nursing due to weaning or death the blastocyst resumes development. A female may have three offspring simultaneously in different stages of development; the blastocyst, the joey in the pouch and a partially weaned offspring (referred to as young-at-foot). The female produces different milk for the joey and the young at foot (the latter is richer).

In most marsupials the pouch opens to the front, whereas the pouch of the Koala opens to the rear, facilitating cecal feeding or cecotrophy. When the young is about 7 months old the mother begins the weaning process by supplementing milk with predigested eucalyptus leaves from her cecum. The joey receives this matter from its mother anus. Cecal feeding is also seen in rabbits and some rodents. The female carries the youngster on her back after it emerges from the pouch and the young will leave the mother at about 18 months.

Skeleton

The corcoid bone in the shoulder of newborn marsupials is a primitive reptilian feature not found in placentals. This bone provides additional strength to the newborn for the climb to their mother's teat. After birth the metacoracoid breaks apart and becomes the corcoid process of the shoulder blade, so the shoulder of an adult marsupial looks like that of a placental.

Foot Structure



A ~ *Peramles sp.*

Long-nosed bandicoot

Is one of the least specialize of the peramelid marsupials

B ~ *Macrotis sp.*

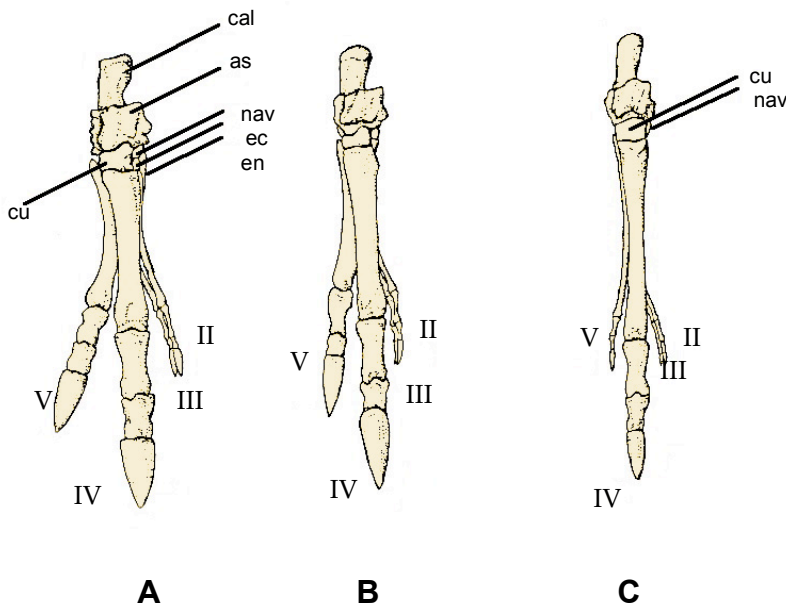
Rabbit bandicoot

C ~ *Chaeropus ecaudatus*

Pig-footed bandicoot

Is one of the more specialize of the peramelid marsupials

as - astragalus
cal - calcaneum
cu - cuboid
ec - ectocuneiform
en - entocuneiform
nav - navicular



A ~ *Thylogale sp.*

Scrub Wallaby

Is one of the least specialize of the macropodia marsupials

B ~ *Macropus sp.*

C ~ *Megaleia rufa*

Red Kangaroo

Is one of the more specialize of the macropodia marsupials

Syndactylism: Hind limbs exhibit syndactylism, a reduction in the number of toes and fusion of the bones that help reduce the danger of dislocation. Horses, antelope, bandicoots and wombats also exhibit syndactylism.

Note: The extreme evolution of these hind feet is not carried over to the forefeet; all these animals have a manus of rather different arrangement, with 2-5 digits of relatively equal size, each with a typical claw.

Dentition

Although dentition varies from family to family, marsupials (except wombats) never have an equal number of incisors above and below. They typically have 4 molars and 3 premolars.

GENERAL FAMILY CHARACTERISTICS

North & South America ~ 2 families

- ***Didelphidae*** ~ opossums: Most have prehensile tails and long snouts. Most species are terrestrial / arboreal and can be insectivorous, carnivorous and/or frugivorous. There is one species in the U.S. may be expanding its range.
- ***Caeolestidae*** ~ shrew opossums: they do not have prehensile tails. With acute sense of smell, poor vision they are nocturnal and insectivorous. They are presently endangered due to expansion of logging and agriculture.

Australia and New Guinea ~ 7 families

- **Marsupial mice and rats:** insectivorous, mainly nocturnal with acute senses
- **Carnivorous Marsupials:** Marsupial cat, Tasmanian wolf (probably extinct) and Tasmanian devil that are aggressive and nocturnal.
- **Marsupial mole:** these are subterranean insectivores with a plate on nose to push dirt and large front claws
- **Bandicoots:** have elongated muzzle, large hind limbs and rat-like tail. They are nocturnal insectivores
- **Koala:** slow moving nocturnal vegetarians with opposable digits and sharp claws adapted for climbing. Second only to the Red-tree mouse that feed on Douglas fir needles, the Koala eats only selected types of Eucalyptus leaves. They have an extremely long cecum to maximize digestion of cellulose from the leaves and extract water.
- **Phalangers:** like the flying squirrel has membranes between front and hind limbs that allow the animal to glide (This is considered parallel evolution).
- **Cuscuses:** these squirrel-like creatures are omnivores with prehensile tails, opposable thumbs adapted for an arboreal life.
- **Wombats:** have short appendages, heavy bodies weighing up to 86 lbs making them the second largest marsupial after the great kangaroos. They are slow moving nocturnal vegetarians that dig extensive burrow systems.
- ***Macropodidae* Family**
This group ranges in size from the 13 oz Musky rat kangaroo to the 187 lb adult Red kangaroo. Their sacculated stomachs allow for more effective digestion of plant materials.
 - **Kangaroos:** (Great Grey & Red) are medium to large herbivores with enlarged hind limbs (feet more than 10 inches in length)
 - **Wallaroos** are medium sized but stockier than kangaroos with feet less than 10 inches
 - **Wallabies** are all smaller and slender in build than the other 2 groups.

Status and Conservation

Since marsupials evolved in Australia, without placental mammals, the introduction of dingoes, feral cats, hares and foxes introduced by human settlers has had a negative impact on many species. Some small species are endangered or extinct because introduced predators have found them to be easy prey. Since no marsupial predator occupied the niche of the fox, small prey had not evolved effective defenses against them. The hare compete for scarce food resources with smaller herbivorous marsupial species while competition with dingoes is thought to have eliminated the Tasmanian wolf from the Australian mainland.

Expanding human settlement and agriculture have altered the habitat of some marsupials and some species (i.e. "shrew" opossums) are endangered by loss of habitat. Grazing sheep have altered or eradicated certain habitats resulting in the decline of numerous small marsupials, while allowing the large kangaroos to expand their range.

Hunting of marsupials for fur has been very limited while hunting as a method of "pest" control has been more widespread. Hunting the Tasmanian wolf to protect sheep may have been a factor in its extinction. Koalas are now protected while various species of kangaroo are still legally hunted for pet food and to reduce the competition with sheep for grass and water. Yet their population remains strong due in part to their ability to survive in harsh environments not suitable for agriculture.

Sources:

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Greizimek's Encyclopedia of Mammals © 1990 Bernard Grizmek, McGraw-Hill, Inc.

The Encyclopedia of Mammals © 1984 David Macdonald, New York: Facts on File

Walker's Mammals of the World © 1999 Ronald M. Nowak, Johns Hopkins University Press