

# XENARTHRA

## Introduction

Recent classifications regard the order Pilosa, anteaters and sloths, and order Cingulata, the armadillos, within the superorder Xenarthra meaning “strange joints”. In the past, Pilosa and Cingulata were regarded as suborders of the order Xenarthra, with the armadillos. Earlier still, both armadillos and pilosans were classified together with pangolins and the armadillo as the order Edentata meaning “toothless”.

The orders Pilosa and Cingulata are distinguishable as the cingulatas have an armoured upper body and the pilosa have fur. Studies have concluded that sloths, anteaters, and armadillos diverged at least 75-80 million years ago and that they are as different from one another as are carnivores, bats and primates.

The Pilosa are now considered almost exclusively a New World order, however, fossil records indicate that they were once found in Europe and possibly Asia. This order may have been distributed worldwide in the Cretaceous period, but became limited to South America and have remained there for most of their history and evolved into numerous groups. The Pilosa were once far more diverse than they are today; there are known to be 10 times as many fossil as living genera.

The superorder is distinguished from all others by what are known as the xenarthrous vertebrae. There are secondary and sometimes even more, articulations between the vertebrae of the lumbar (lower back) series. In other words, consecutive vertebrae connect in more than one place. In addition, the pelvis connects with more of the spine than in other mammals. These adaptations to the spine give support, particularly to the hips. The name Xenarthra refers to this peculiarity of the spine and modern taxonomy places these three groups of animals together, even though they are very different from one another and they are highly specialized.

The xenarthran hand usually has two or three digits that are much longer than the others, when present, and all the fingers have long, strong claws. The foot usually has five toes. The bones of the lower arm are separate, whereas, the bones of the lower leg either are separate, united at the ankle, or joined at both ends. The bones and musculature of the upper arms are well developed for digging. The mammae are located near the armpit, on the chest, or on the abdomen. Females have a common urinary and genital duct. The testes are internal and are located in the abdominal cavity between the rectum and the urinary bladder. Xenarthrans have a double posterior vein that returns blood from the posterior part of the body to the heart, whereas most other mammals have only a single vein. Clavicles are present in living xenarthrans; the pelvis is narrow and elongate; and the neck vertebrae vary from six to nine. All other mammals, except for manatees, have seven.

Although Edentata signifies toothlessness, only the anteaters actually have no teeth. None of the living xenarthrans has incisors or canines. The cheek teeth of the tree sloths and armadillos lack

enamel and are open at the root which indicates that these teeth grow continuously throughout life of the animal.

Brain size in living xenarthrans is relatively small, with the cerebrum's external structure indicating that the armadillos are the most original group, followed by the sloths, then the anteaters, which represent the highest level of brain development of the Xenarthra.

Armadillos and the giant anteater live on the ground and are active by day or night. Other anteaters dwell mainly in trees and are usually nocturnal. Sloths are restricted to trees and are active mainly at night. Xenarthrans are chiefly solitary but may form small, loose associations. All have a good sense of smell; anteaters have poor eyesight and hearing; sloths have good vision but poor hearing; and armadillos have relatively good vision and hearing. Anteaters and some armadillos are basically insectivorous. Other armadillos are omnivorous, feeding on invertebrates, small vertebrates, some plant material and carrion. Sloths are herbivorous.

Xenarthra have low metabolic rates and low body temperatures (ave. 34°C vs. 36 - 38°C of other mammals) which limits them geographically to warmer regions. The present range of xenarthrans extends from the extreme south of Patagonia in Argentina throughout South and Central America and into the United States as far as Kansas and Missouri, living in such various terrains as mountain areas, tropical rainforest, open woodlands, savannas, pampas, and croplands. There is only one xenarthran in the United States and that is the nine-banded armadillo (*Dasypus novemcinctus*).

## Evolution

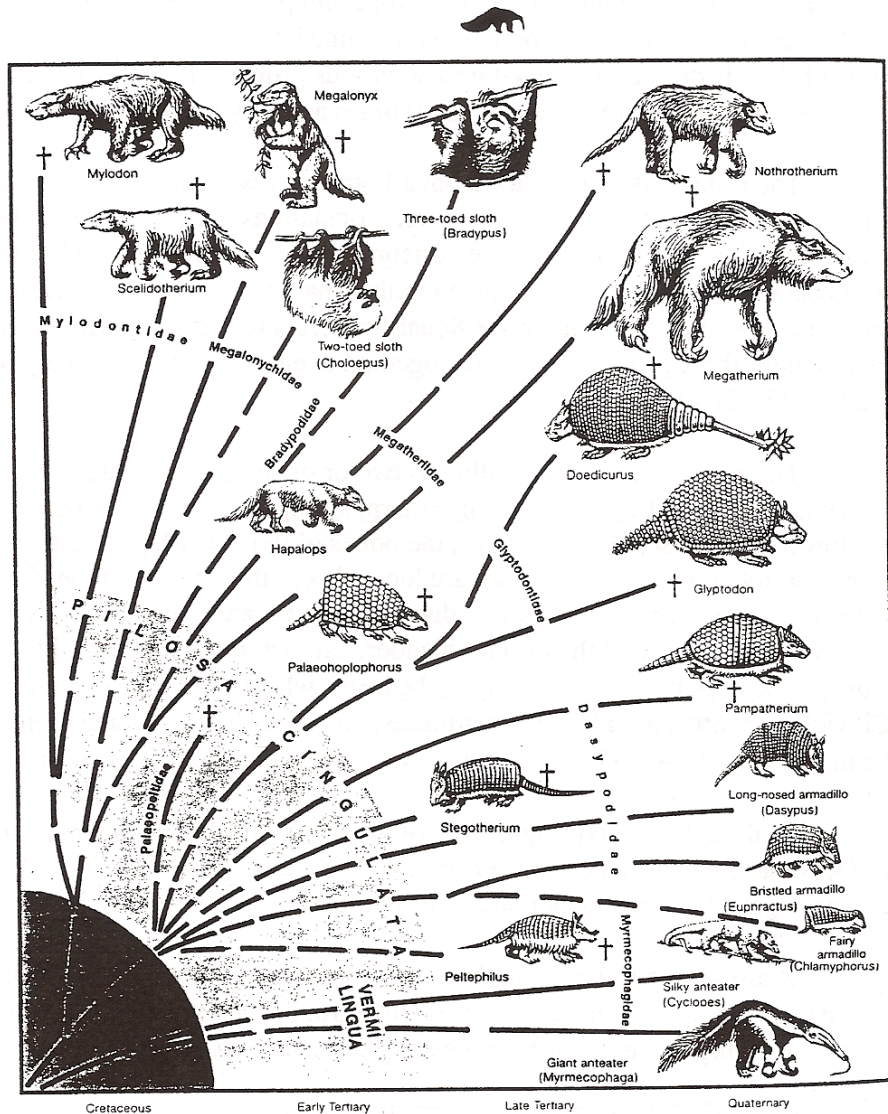
The first edentates may have been around to witness the extinction of the dinosaurs though the earliest known edentates are present 60 mya. But to see their zenith we must come to the Oligocene and Pleistocene 38 million - 10,000 years ago. During this period there were 3 families of Giant ground Sloths, some up to 20 ft in length and four families of armored giant armadillo-like creatures. *Glyptodon* reached c.14 ft in length and 5 ft tall. Some of these creatures survived long enough to become imbedded into the legends of Patagonia Indians.



The earliest xenarthrans were arboreal herbivores with simple, stubby teeth, small brains, fused pelvises, and sturdy spines.

The family tree of the Xenarthra, an ancient group of animals, page 3, from Grzimek's **Encyclopedia of Mammals**, 1991. The three groups, anteaters, armadillos, and sloths, separated early, which is one reason for the differences in their appearance. (A cross "+" next to an image indicates that group is extinct.)

NEW WORLD EDENTATES



**General characteristics of the order**

1. Edentata means "without teeth"
2. A tendency towards rigidity of the spine
  - a. Xenarthran processes on vertebrae (especially lumbar): lends support to the hips which is important for digging
  - b. Fusion of vertebrae with pelvic girdle
  - c. Fusion of cervical vertebrae
3. Double, posterior vena cava (single in other mammals)
4. Females have a primitive divided womb, like marsupials, and a common urinary and genital tract
5. Have a clavicle and an well-developed coracoid process used for attaching muscles for digging
6. Chiefly solitary but may form small, loose associations.

## Physical and Behavioral Adaptations

Females have a divided womb that is modified from the double womb of marsupials. Males have internal testes and small penis. A tendency towards rigidity of the spine due to Xenarthran processes on vertebrae (especially lumbar). They have between 5 - 9 cervical vertebrae depending on the species, whereas most other mammals have 7. Cervical vertebrae and vertebrae with pelvic girdle are fused. Dermal bone plates covered by epidermal scales varies from a complete protective covering that allow some to roll into a ball, to a more loose fitting one that doesn't completely cover with sparse hair.

## Hands and Feet

Plantigrade hind feet have five toes while the front feet have either four or five depending on species, three of which have claws that allow for digging or climbing.

## Tails

Tails vary with species, from Sloth without/stub to Giant Anteater's 36" bushy tail and scaly in the armadillos. Some are even prehensile as in the Collared anteater.

## Dentition

No members of this group have canines, incisors or premolars. Teeth are cylindrical, rootless or have a single root while cheek teeth lack enamel.

## Sensory Organs

Eyesight is poor while hearing is reduced (sloth show no pinnae) while sense of smell is more developed.

## Communication

Primary vocalizations are between mother and young

## Status and Conservation

All edentates are under increased pressures from human activities from deforestation, hunting and agricultural demands.

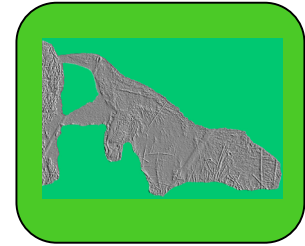
## Other Notes

Carolus Linnaeus (1707-1778) placed the SE Asian & African Pangolins in with the Edentates, since that time the 1 genus, *Manis* and its 7 species has been placed in their own Order - Pholidota.

## Families

### A. **Myrmecophagidae** (giant anteater, tamanduas and silky anteater)

1. Terrestrial and arboreal
2. Very long, tubular rostrums, very small mouths
3. Rapid moving, long, sticky tongue. Tongue has tiny, barb-like spines directed posteriorly. Sticky saliva traps insects.
4. No teeth
5. Insectivorous. Feed on social insects: ants, termites, bees.
6. Crush insects with thickened stomach (pyloric portion)
7. Large front claws for opening up termite mounds, tearing up rotting logs, etc. Claws so large they cannot walk on the soles of their forefeet.
8. Three arboreal species have prehensile tails.
9. Anteaters give birth to a single young, which rides on the mother's back. Because she has no teeth or fingers, the mother cannot pick up her young; it must crawl up onto her back by itself.
10. Good sense of smell, poor vision and hearing.



### B. **Megalonychidae** (two-toed sloths & extinct ground sloth) and **Bradypodidae** - meaning "slow foot" (three-toed sloth)

Scientists divide modern sloths into two families based on the number of toes on their forefeet. Sloths are folivorous, slow moving and arboreal. Two-toed sloths are more active than three-toed sloths and tend to be bigger and heavier also. Sloths get poor nutrients from their leaf diets resulting in them moving very slowly to conserve energy.

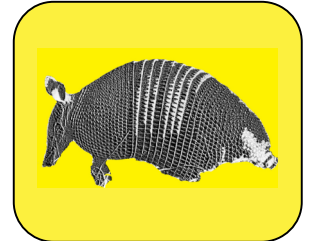


1. Arboreal (have great difficulty moving on the ground) and mainly active at night.
2. Often move upside-down on the underside of branches
3. Long-limbed with forelimbs longer than hind and short bodies and short and rounded skulls
4. Toes are fused (**syndactyl**). Claws form a hook by which sloths can hang passively from a branch or clasp objects.
5. Cervical vertebrae are variable in number (6-9) allowing for greater neck mobility; neck can rotate over 90°
6. Teeth (5 simple peglike teeth on each side upper jaw, 4 on lower = 18 total)
  - Lack incisors and canines
  - Cylindrical, homodont, rootless teeth
7. Tail rudimentary or non-existing (depending on species)
8. Long, coarse hair on which blue-green algae grows giving them a greenish appearance. This is a commensal mutualism, where both benefit without selective pressures on each other; the sloth provides a suitable habitat for the algae and greenish tint combined with its slow motion provide camouflage for the sloth.
9. Herbivorous: mainly forest canopy leaves but also eat buds, flowers and fruit

10. Very, very low metabolic rate and poor temperature regulation. They body temperatures are variable, which fluctuate with the ambient temperature and sloths bask to warm themselves.
11. Good sense of smell, good vision but poor hearing.

#### D. Dasypodidae (armadillos)

1. **Carapace** covers most of the body and consists of dermal bone plates covered by epidermal scales that vary from a complete protective covering when animals roll into a ball, to a looser fitting one that doesn't completely cover. It is attached to axial skeleton by muscles and ligaments (not in direct contact with the skeleton)
2. The belly is soft and unprotected by bone except when some species are able to curl into a ball.
3. Sparse hair covering
4. Teeth
  - Lack incisors and canines
  - Teeth are cylindrical and rootless (Giant armadillo may have hundreds)
5. Most are terrestrial and fossorial (diggers). All are well equipped for digging. All armadillos have powerful forelimbs, with 3-5 digits (depending on the species) tipped with heavy, curved claw
6. Eat insects and insect larvae, with occasional plant material, eggs, berries, etc.
7. Good sense of smell, good vision and hearing.



#### **Sources:**

updated 11/12

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