# 32–2 Diversity of Mammals

## Guide for Reading

**Key Concepts**

- How do the three groups of living mammals differ from one another?
- How did convergent evolution cause mammals on different continents to be similar in form and function?

**Vocabulary**

monotreme
marsupial
placenta

**Reading Strategy: Summarizing** As you read, make a list of the major groups of mammals. Write several sentences describing the characteristics of each group. Then, give an example for each.

The class Mammalia contains about 4500 species, and the diversity of these species is astonishing. From a tiny mouse nibbling its way along a corncob to an African elephant uprooting a gigantic tree with its tusks and trunk, mammals have the greatest range of size of any group of vertebrates.

As you have read, tooth structure is one characteristic that scientists use to classify mammals. Mammals are also classified by the number and kinds of bones in the head. But the most important way to categorize living mammals is by the way they reproduce and develop.

The three groups of living mammals are the monotremes (MAHN-oh-treemz), the marsupials (mahr-SOO-pee-ulz), and the placentals. These three groups differ greatly in their means of reproduction and development.

## Monotremes and Marsupials

**Monotremes lay eggs. Marsupials bear live young, but at a very early stage of development.** All monotremes are grouped in a single order, while marsupials are split into several different orders.

**Monotremes** Members of the **monotremes,** or egg-laying mammals, share two notable characteristics with reptiles. In monotremes, the digestive, reproductive, and urinary systems all open into a cloaca that is similar to the cloaca of reptiles. In fact, the name *monotreme* means "single opening." Reproduction in monotremes also resembles reproduction in reptiles more than other mammals. As in reptiles, a female monotreme lays soft-shelled eggs that are incubated outside her body. The eggs hatch into young animals in about ten days. Unlike young reptiles, however, young monotremes are nourished by their mother's milk, which they lick from pores on the surface of her abdomen.

Only three species of monotremes exist today: the duckbill platypus, shown in **Figure 32–9,** and two species of spiny anteaters, or echidnas. These animals are found in Australia and New Guinea.

**Figure 32–9** **Like all monotremes, the platypus lays eggs that hatch outside the body but nourishes its young with milk produced in mammary glands.** The unusual snout of this duckbill platypus can sense electromagnetic signals put out by the muscles of other animals. The platypus uses its sensitive snout to locate prey, such as worms and mollusks, that burrow in the sediments.

**Marsupials** Kangaroos, koalas, and wombats are examples of **marsupials**—mammals bearing live young that usually complete their development in an external pouch. When marsupials reproduce, the fertilized egg develops into an embryo inside the mother's reproductive tract. The embryo is born at a very early stage of development. It crawls across its mother's fur and attaches to a nipple. In most species of marsupials, the nipples are located in a pouch called the marsupium (mahr-SOO-pee-um) on the outside of the mother's body. Marsupials are named after this structure. Once inside the marsupium, the embryo, looking much like the one in **Figure 32–10,** spends several months attached to the nipple. It will continue to drink milk in its mother's pouch until it grows large enough to survive on its own.

CHECKPOINT *How does a marsupial differ from a monotreme?*

**Figure 32–10** Most marsupials, including this wallaby, are originally from Australia and New Guinea. **Marsupials bear live young that usually complete their development in a pouch.** The pink, newborn wallaby (inset) is still an embryo but will soon grow into a "joey" that resembles a small adult.

## Placental Mammals

Placental mammals are the mammals with which you are most familiar. Mice, cats, dogs, whales, elephants, humans, and the sea lions in **Figure 32–11** all fall within this category. This group gets its name from an internal structure called the **placenta,** which is formed when the embryo's tissues join with tissues from within the mother's body.

**In placental mammals, nutrients, oxygen, carbon dioxide, and wastes are exchanged efficiently between embryo and mother through the placenta.** The placenta allows the embryo to develop for a much longer time inside the mother—from a few weeks in mice and rats to as long as two years in elephants. After birth, most placental mammals care for their young and provide them with nourishment by nursing. **Figure 32–12,** on the following pages, describes the main orders of placental mammals.

◀ **Figure 32–11** The California sea lion is an example of a placental mammal. **In placental mammals, nutrients, oxygen, carbon dioxide, and wastes are exchanged between embryo and mother through the placenta.**

## FIGURE 32–12 ORDERS OF PLACENTAL MAMMALS

The 12 orders of mammals shown on these pages contain the vast majority of living placental species. **Classifying** *How are perissodactyls similar to artiodactyls? How are the two orders different?*

### ◀ INSECTIVORES

These insect eaters have long, narrow snouts and sharp claws that are well suited for digging. *Examples:* shrews, hedgehogs (shown here), moles.

### ◀ CHIROPTERANS

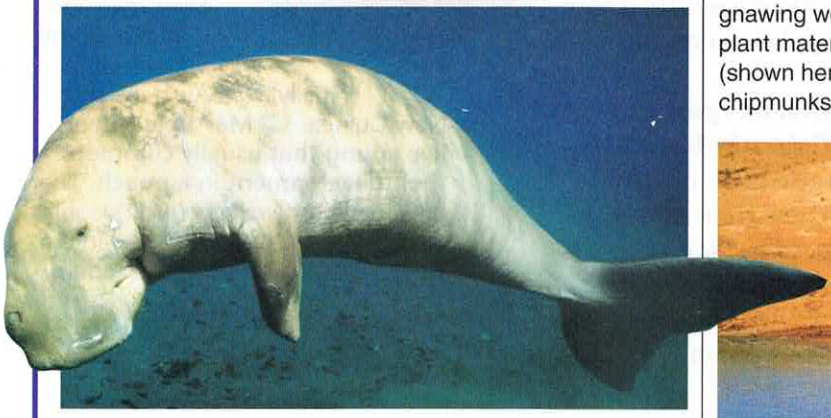
Winged mammals—or bats—are the only mammals capable of true flight. Bats account for about one-fifth of all mammalian species. They eat mostly insects or fruit and nectar, although three species feed on the blood of other vertebrates.

### RODENTS ▶

Rodents have a single pair of long, curved incisor teeth in both their upper and lower jaws, which they use for gnawing wood and other tough plant material. *Examples:* mice, rats (shown here), voles, squirrels, beavers, porcupines, gophers, chipmunks, gerbils, prairie dogs, chinchillas.

### ▼ SIRENIANS

Sirenians are herbivores that live in rivers, bays, and warm coastal waters scattered throughout most of the world. These large, slow-moving mammals lead fully aquatic lives. *Examples:* manatees, dugongs (shown here).

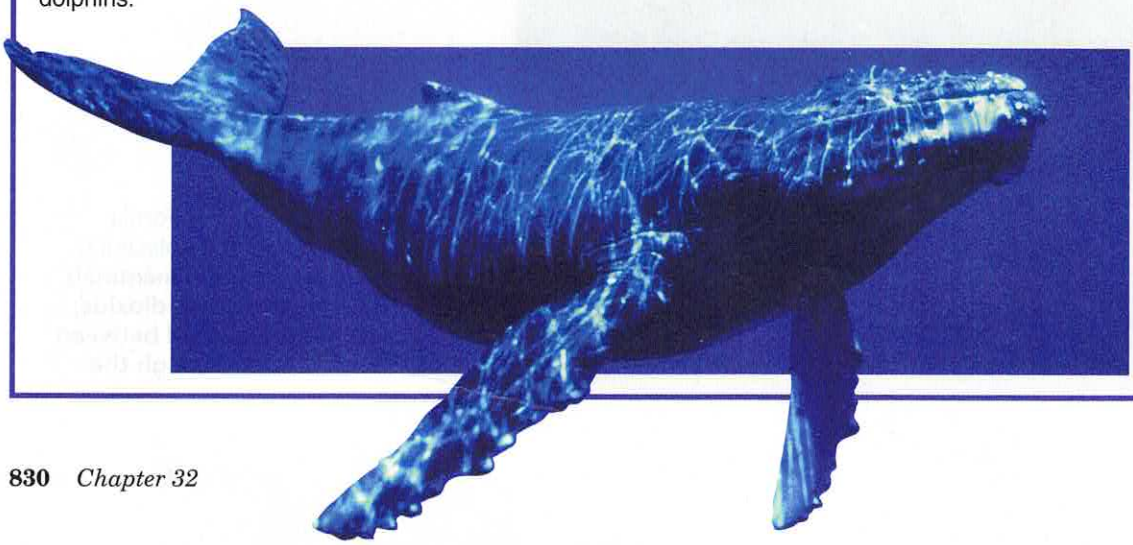


### ▲ PERISSODACTYLS

This order contains hoofed animals with an odd number of toes on each foot. *Examples:* horses, tapirs, rhinoceroses, and zebras (shown here).

### ▼ CETACEANS

Like sirenians, cetaceans—the order that includes whales and dolphins—are adapted to underwater life yet must come to the surface to breathe. Most cetaceans live and breed in the ocean. *Examples:* humpback whales (shown here), narwhals, sperm whales, beluga whales, river dolphins.



### ▲ CARNIVORES

Many mammals in this order, such as tigers and hyenas, stalk or chase their prey by running or pouncing, then kill the prey with sharp teeth and claws. Some animals in this group eat plants as well as meat. *Examples:* dogs, foxes, bears, raccoons, walruses (shown here).

### ▲ XENARTHRANS

Most of the mammals in this order have simple teeth without enamel, and a few have no teeth at all. *Examples:* sloths, anteaters, armadillos (shown here).

### ◀ ARTIODACTYLS

These hoofed mammals have an even number of toes on each foot. Like perissodactyls, this order contains mostly large, grazing animals. *Examples:* cattle, sheep, goats, pigs, ibex (shown here), giraffes, hippopotami, camels, antelope, deer, gazelles.

### ◀ PRIMATES

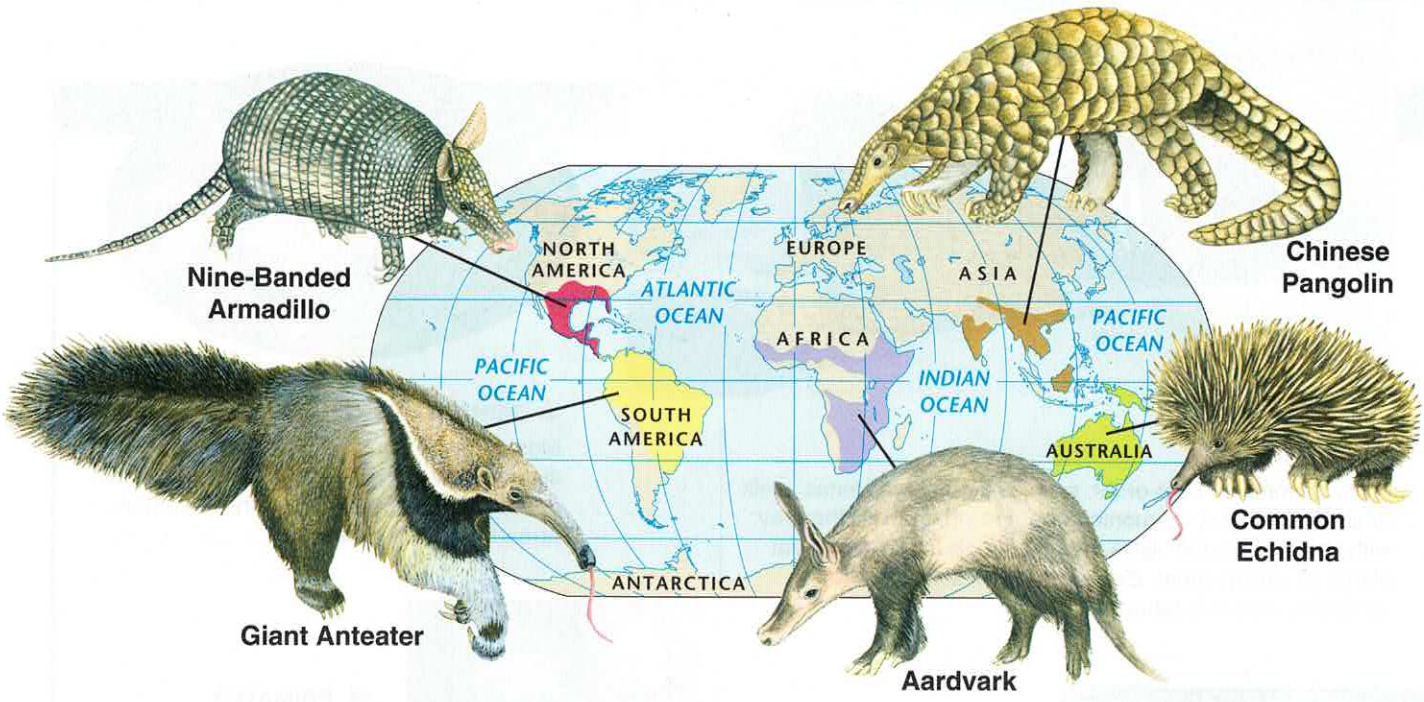
Members of this order are closely related to the ancient insectivores but have a highly developed cerebrum and complex behaviors. *Examples:* lemurs, tarsiers, apes, gibbons, macaques (shown here), humans.

### ▼ PROBOSCIDEANS

These are the mammals with trunks. Some time ago, this order went through an extensive adaptive radiation that produced many species, including mastodons and mammoths, which are now extinct. Only two species, the Asian elephant and this African elephant, survive today.

### ▲ LAGOMORPHS

Like rodents, members of this order are entirely herbivorous. They differ from rodents by having two pairs of incisors in the upper jaw. Most lagomorphs have hind legs that are adapted for leaping. *Examples:* Snowshoe hares (shown here), rabbits.




▲ **Figure 32–13** Similar ecological opportunities on different continents have resulted in convergent evolution among these and other mammals. Mammals that feed on ants and termites evolved not once but five times in different regions. Powerful front claws; a long, hairless snout; and a tongue covered with sticky saliva are common adaptations in these insect-eating animals.

## Biogeography of Mammals

The history of Earth's geography has helped shape today's mammals. During the Paleozoic Era, the continents were one large landmass, and mammals could migrate freely across it. But as the continents drifted farther and farther apart during the Mesozoic and early Cenozoic Eras, ancestors of mammal groups were isolated from one another. Each landmass took with it a unique array of mammal groups.

**Similar ecological opportunities on the different continents have produced some striking examples of convergent evolution in mammals.** Thousands of kilometers apart, mammals such as those in **Figure 32–13** evolved similar adaptations in form and function. When some of the landmasses merged in the late Cenozoic Era, mammals dispersed and intermingled in new habitats. Living mammals reflect the diversity that resulted from these events.

## 32–2 Section Assessment

1. **Key Concept** Name the three groups of living mammals and describe the ways each develops.
2. **Key Concept** With regard to mammals, what was the result of continental drift?
3. What is the function of the placenta?
4. List the major orders of placental mammals.
5. What characteristic distinguishes lagomorphs from rodents?
6. **Critical Thinking Inferring** How are powerful front claws and sticky tongues useful adaptations in mammals that feed on ants?

### Thinking Visually

**Comparing and Contrasting**

Create a compare-and-contrast table that describes the characteristics of monotremes, marsupials, and placental mammals. Include characteristics that they share as well as ways in which they differ.