

children's illustrated encyclopedia

Animals

2: Mammals



 Orpheus

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THE RISE OF MAMMALS I

SINCE THE beginnings of life on Earth, all animals have gradually changed. Some have developed (or “lost”) legs, while others have grown horns, beaks or wings. Some kinds have died out altogether, giving way to others that are better suited to their environment. This process of change and adaptation is called **evolution**.

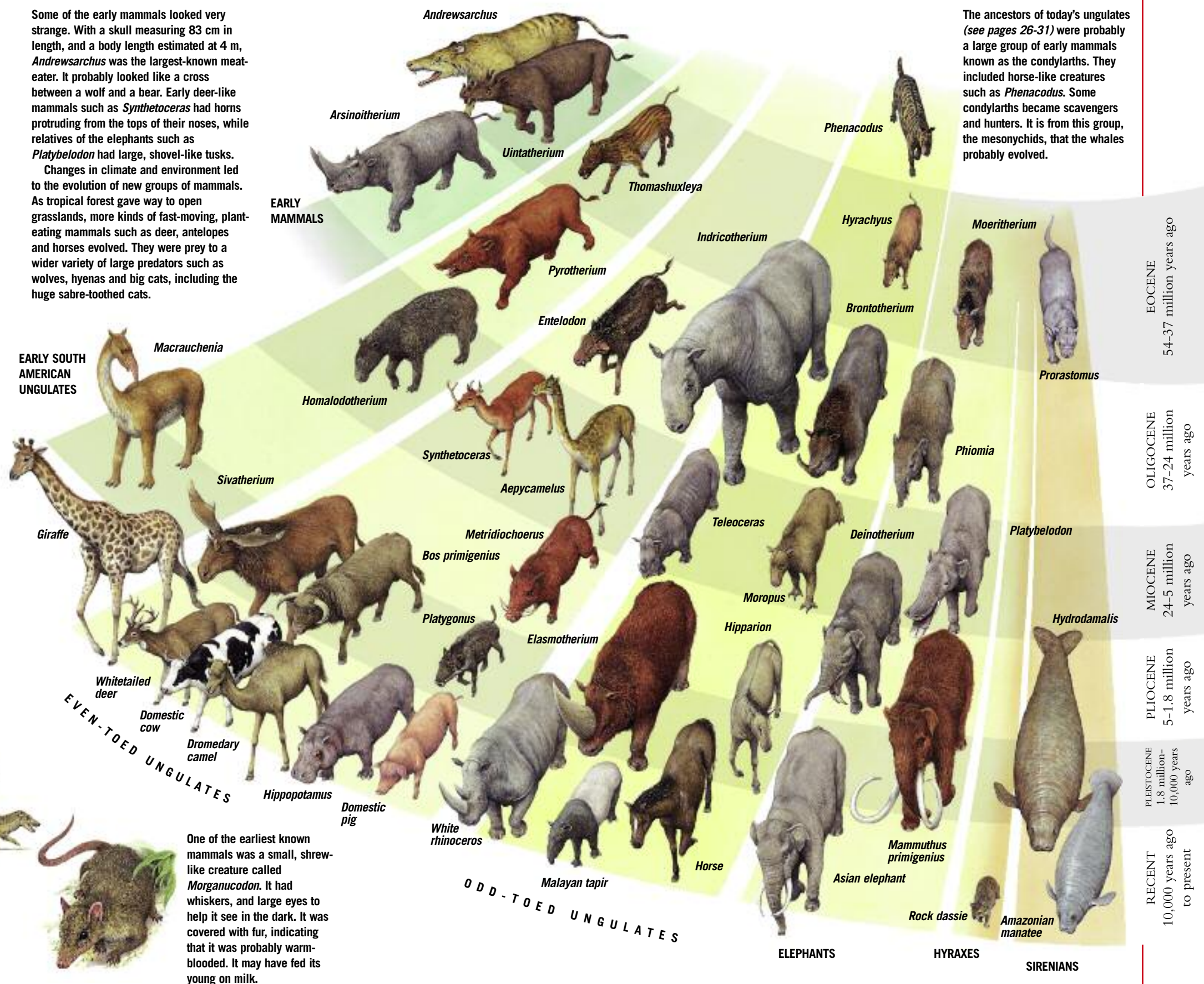
Mammals are descended from mammal-like reptiles called pelycosaur that lived on Earth about 300 million years ago. The first warm-blooded animals were probably the cynodonts. Small, fast-moving carnivores, the cynodonts may have had fur rather than scales. Fur is an essential feature of warm-blooded animals, as it helps them to keep their bodies at a stable temperature.

The first true mammals evolved about 210 million years ago, when the dinosaurs dominated the Earth. In order to avoid the dinosaurs, the mammals came out only at night. Gradually, the three main groups of mammals evolved: marsupials, monotremes and placental mammals. The extinction of the dinosaurs meant that there was suddenly an absence of any large animals on land. This gave the mammals the opportunity they needed to spread rapidly and evolve into many different species.

Some of the early mammals looked very strange. With a skull measuring 83 cm in length, and a body length estimated at 4 m, *Andrewsarchus* was the largest-known meat-eater. It probably looked like a cross between a wolf and a bear. Early deer-like mammals such as *Synthetoceras* had horns protruding from the tops of their noses, while relatives of the elephants such as *Platybelodon* had large, shovel-like tusks.

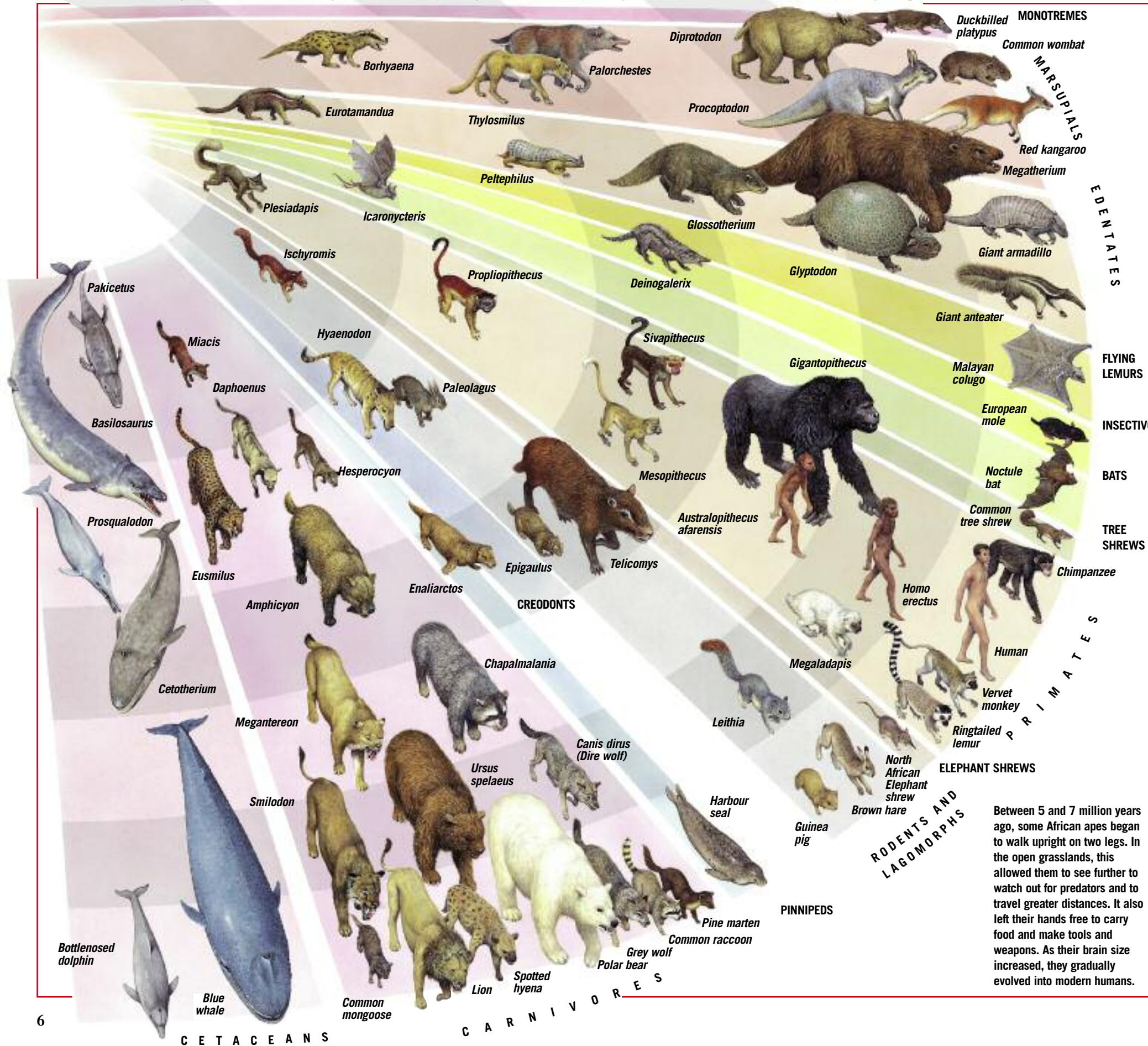
Changes in climate and environment led to the evolution of new groups of mammals. As tropical forest gave way to open grasslands, more kinds of fast-moving, plant-eating mammals such as deer, antelopes and horses evolved. They were prey to a wider variety of large predators such as wolves, hyenas and big cats, including the huge sabre-toothed cats.

The ancestors of today's ungulates (see pages 26-31) were probably a large group of early mammals known as the condylarths. They included horse-like creatures such as *Phenacodus*. Some condylarths became scavengers and hunters. It is from this group, the mesonychids, that the whales probably evolved.



Several of the pelycosaur, such as *Dimetrodon* (above left) had large sails of bony rods covered with skin on their backs. These may have helped to control their body temperatures by taking in or giving off extra heat. *Moschops* (above centre) was a large, plant-eating therapsid. It gave way to the increasingly mammal-like cynodonts, such as the meat-eating *Thrinaxodon* (above right).

One of the earliest known mammals was a small, shrew-like creature called *Morganucodon*. It had whiskers, and large eyes to help it see in the dark. It was covered with fur, indicating that it was probably warm-blooded. It may have fed its young on milk.



THE RISE OF MAMMALS II

WHEN THE first mammals appeared, all the continents were locked together in one large landmass. Over millions of years, they gradually drifted apart. This meant that the mammals were split up on to large “islands”, where they evolved into many different groups.

North and South America eventually drifted back together again, and mammals from the two continents found themselves competing for food and territory with unfamiliar “relatives”. They also faced new predators. Some kinds died out altogether. The marsupials suffered in most parts of the world, but in Australasia, which was still isolated, many were able to thrive.

Around the world, each kind of mammal adapted to its environment. Giraffes evolved a very long neck to browse from the tallest trees which other mammals could not reach. Whales and dolphins lost the fur and four legs of their ancestors and developed tails and fins to move more easily through the water.



Bats are the only mammals that have been able to conquer the skies in the same way as the birds. Their skeletons have changed very little since the earliest forms (above). While other mammals developed flaps of skin to glide from tree to tree, the bats had elongated fingers, forming wings that gave them the ability to fly. As the birds dominated the skies during the day, bats hunted at night. Many developed echolocation systems (see page 12) to locate their insect prey.

Between 5 and 7 million years ago, some African apes began to walk upright on two legs. In the open grasslands, this allowed them to see further to watch out for predators and to travel greater distances. It also left their hands free to carry food and make tools and weapons. As their brain size increased, they gradually evolved into modern humans.

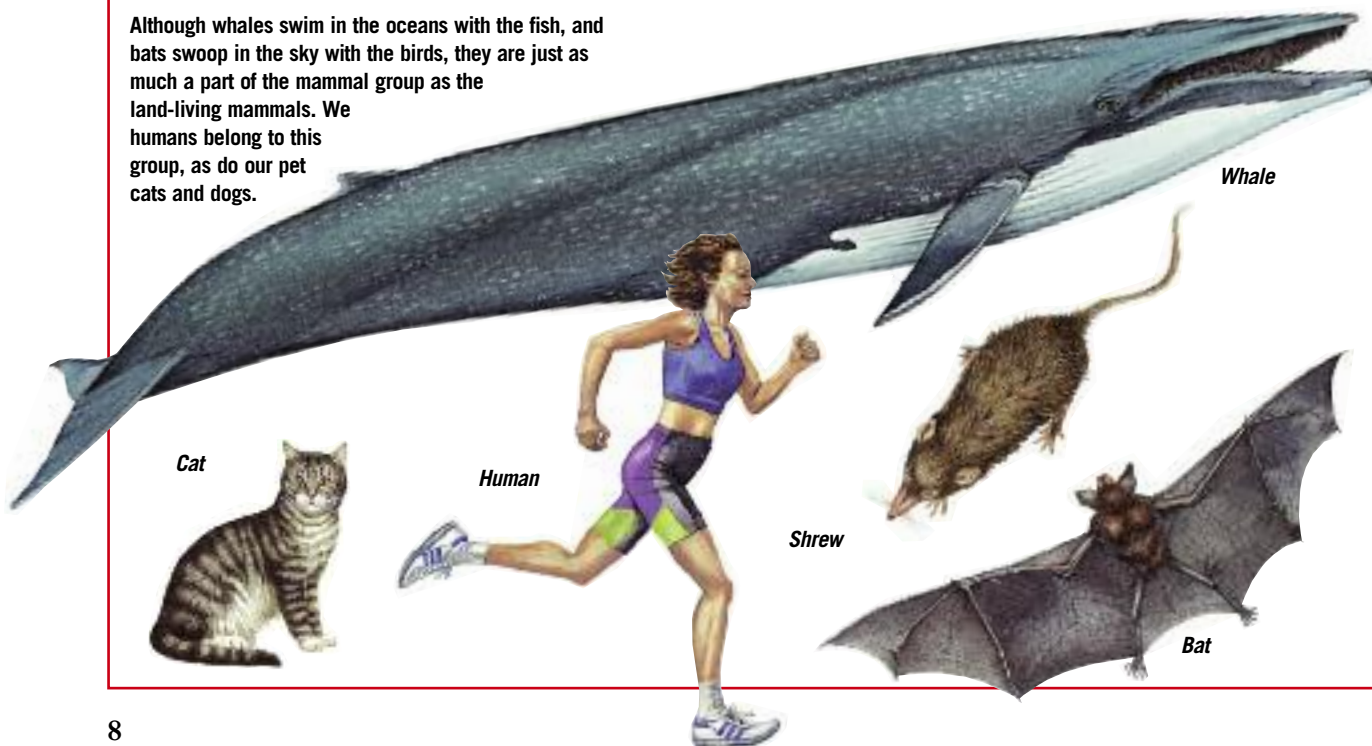
MAMMALS

MAMMALS are the group of animals to which humans belong. They are vertebrates (animals with a backbone) that give birth to live young and then feed them with milk. Most mammals have four limbs and a covering of hair or fur. Sea mammals, such as whales, have adapted to life in the water by losing their hair and hind limbs and forming their front limbs into flippers.

All mammals are warm-blooded, which means that their bodies can control their own temperature. They obtain warmth from the process of burning fuel (food) inside the body, rather than from basking in the sun as the cold-blooded reptiles do. The skin and hair of the body are very important both for keeping in warmth in cold conditions and letting it escape to cool off the body in hot conditions. Most mammals also produce sweat, which cools the skin as it evaporates.

Mammals have large brains and complex sensory and circulatory systems. They rely on their sense of smell more than any other kind of animal. Scent is used to communicate between members of the same species, to mark the borders of a territory, to find food and to detect an approaching predator.

Although whales swim in the oceans with the fish, and bats swoop in the sky with the birds, they are just as much a part of the mammal group as the land-living mammals. We humans belong to this group, as do our pet cats and dogs.



African wild dogs are placental mammals. The young dog feeds on its mother's milk through nipples on her belly.

The most important feature which sets mammals apart from other animals is the way they care for their young after birth. All female mammals have mammary glands which produce milk after their young are born. The young feed on this milk, which gives them all the nutrition they need, until they are able to survive and feed on their own. By not having to find their own food, they can put all the energy gained from feeding into growing larger and stronger.

During the period of suckling (feeding on milk), and also while the young learn to feed for themselves, the mother will protect them as much as possible from predators.

Some female mammals raise their young alone while others share the task with the father or other members of a group.

Most mammalian young, apart from the monotremes, are born live (not inside an egg). Small mammals can give birth to several young at one time, which grow and become independent quite quickly. The young of large mammals take longer to grow to full size, and need more care, so litter size (the number of young born at once) is smaller, often only one at a time.

All mammals except the marsupials and the monotremes are born fully formed, though some, such as rabbits, are hairless, blind and helpless. They can grow further while in the safety of their burrow or den.



Kangaroos are marsupials. The under-developed young suckle inside the mother's pouch.



In contrast, animals that live in open spaces, such as horses, cattle or deer, are able to walk and even run a few minutes after birth. If a predator appeared, they would need to run away with the rest of the herd.

Many mammals live in social groups that can be made up of a few or many animals. Often the whole group will help to rear and protect the young. Carnivores such as lions or hyenas also hunt together, using their combined strength and skill to kill larger animals than they could tackle alone. Herbivores, such as deer or cattle, form large herds that give them some protection against predators.

MONOTREMES

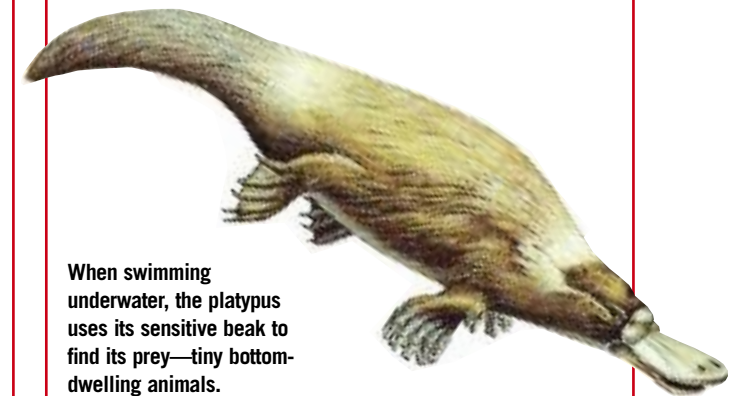
Echidnas lay tiny soft-shelled eggs (right). The young cling to the small pouch, licking up milk which seeps on to the mother's fur.



LIKE MARSUPIALS (see page 10), monotremes give birth to under-developed young. However, monotreme young are born inside soft-shelled eggs. These hatch after a few days, and the young are suckled until they have developed fully.

There are two kinds of monotremes: the echidna and the platypus. Both are found only in Australia and surrounding islands. Echidnas have a small pouch that holds their young after hatching. Platypuses do not have a pouch, but instead leave their young in a special burrow.

Apart from a few types of shrew, monotremes are the only venomous mammals. Echidnas cannot use their venom but the platypus can kill a dog with poison ejected from a sharp spur on its leg.



When swimming underwater, the platypus uses its sensitive beak to find its prey—tiny bottom-dwelling animals.

MARSUPIALS

MARSUPIALS are mammals that do not give birth to fully developed young. Instead, the young are born at a very early stage, and then continue to develop while clinging to their mother's body.

When the young marsupial is born, it is tiny, blind and hairless. Its limbs are not even properly formed, but somehow it still manages to crawl through its mother's fur to find its mothers' nipples. Many marsupials, including kangaroos and wombats, have large pouches of skin around their nipples. A kangaroo's pouch is deep and forward-facing, so that the young kangaroo does not fall out. Wombats are burrowing animals, so



Koalas spend three-quarters of their day sleeping, stirring only as dusk falls. They spend all their time in trees, feeding almost entirely on eucalyptus leaves.

Most (but not all) marsupials live only in Australia. For millions of years, until the arrival of humans, Australia was isolated from the rest of the world. On the other continents, marsupials tended to lose out in competition for food with the placental mammals (those mammals that are born fully developed) and so, with the exception of the opossum family in the Americas, they died out. In Australia, they had no other mammalian rivals and so they thrived.

Some marsupial species live in the Americas, primarily in South America. The woolly opossum, a fruit-eater, lives in Amazon rainforest trees.



they have backward-facing pouches to stop soil getting inside. Other marsupials hardly have any pouch at all. Their young simply hang on to the nipples until they are old enough to let go.

If a female marsupial has only one or two young, she can carry them in her pouch or, like the koala, on her back. Small marsupials, such as possums or bandicoots, which have several young at a time, must transfer them to a nest when they become too heavy to carry around.



Kangaroos move by bounding along on their immensely strong hind legs. In a single bound, a kangaroo can leap as far as three cars parked end-to-end.

EDENTATES

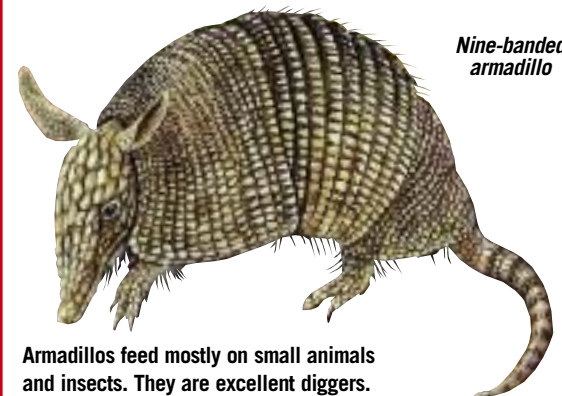
EDENTATES are a group of mammals made up of anteaters, armadillos and sloths. The word "edentate" means "without teeth", but only the anteaters have no teeth at all. Armadillos and sloths have a few very simple, grinding teeth.

Sloths live in the rainforest of South America. They spend nearly all their time hanging upside down in the trees, feeding on leaves. Sloths move so slowly that they may only travel a few metres every day. In wet weather, a layer of green algae grows on



Three-toed sloth

Sloths are so well-adapted for living upside down that their fur grows upwards from their bellies instead of downwards from their backs.



Nine-banded armadillo

Armadillos feed mostly on small animals and insects. They are excellent diggers. Their clawed front feet work at speed to quarry the soil while their back feet push it away as it piles up underneath them. They can hold their breath for up to six minutes to avoid breathing in dust.

their fur, which helps to camouflage them among the trees.

Armadillos do not need camouflage—they have a suit of armour to protect themselves. Made of bony plates, it covers the whole body, including the tail, head and limbs. Only the belly is soft, and some kinds of armadillo can protect even this part by curling themselves up into a ball.

Anteaters feed on both ants and termites, which they detect using their keen sense of smell. The tongue of the giant anteater can unfurl an amazing 60 centimetres.

Anteaters break open ant or termite mounds with their strong, sharp claws, and lap up the insects with their long, sticky tongues.

Giant anteater



BATS

SEVERAL KINDS of mammals can glide through the air for short distances, but bats are the only mammals that can truly fly. Their wings are made of skin stretched tightly between the long fingers of their hands and their ankles.

Vampire bats feed on blood, often from cows or pigs. They lap up the blood like a cat lapping up milk. Their saliva contains a chemical to stop the blood from clotting.

Though the wings of this flying fox look fragile, they are strong and quick to heal if torn. The long thumb claws hold fruit while feeding.

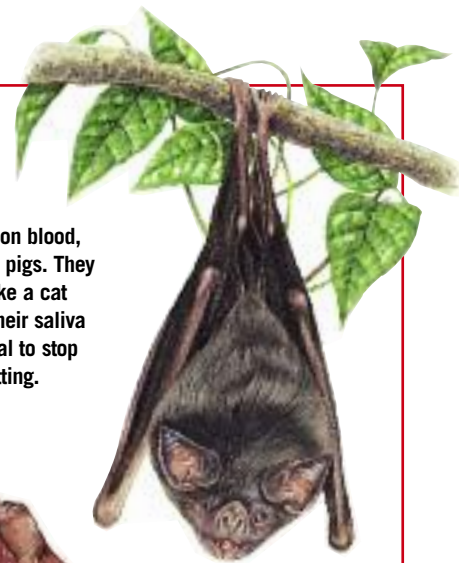
Bats make up almost a quarter of all species of mammals in the world today. There are two main groups of bats: one is the flying fox family and the second contains all other bat families. The flying foxes have fox-like heads, and feed mostly

While some kinds of bats hibernate during the winter, others migrate to warmer climates. Noctule bats travel an incredible 1600 km across eastern Europe during their migration.

on plant material, including fruits, flowers, nectar and pollen. They use their large eyes and keen sense of smell to find their food.

Most members of the second group of bats are carnivores, feeding on insects, small mammals, frogs, birds and even fish. These bats generally hunt at night, using echo-location to find their prey. They produce very high-pitched squeaking sounds through their noses or mouths, and then use their large ears to listen to the echoes that bounce back. The bats are then able to build up a picture of their surroundings so that they can fly at top speed and catch insects in flight even in pitch darkness.

Bats usually hunt at night and rest during the day, hanging upside down in caves, hollow trees or even buildings. Some kinds of bats roost singly while others will gather together in their thousands. Many female bats will roost together in "nursery" colonies where they leave their babies clustering together for warmth while they go out to hunt.



INSECT-EATERS

THE INSECTIVORES are a group of small mammals that includes hedgehogs, moles and shrews, as well as some lesser-known animals such as tenrecs and the rare solenodons. Many insectivores are nocturnal, emerging at night to feed. They have long snouts and a very keen sense of smell which they use to find their prey. Most insectivores eat insects, worms and other tiny creatures, but some shrews are able to kill quite large prey such as frogs.



The pangolin's thick scales cover almost all of its body. They are regularly shed and replaced.

Larger animals such as **pangolins** and **aardvarks** are also insect-eaters. They feed from ant or termite nests, shooting their long, sticky tongues in and out to pick up many insects at once. Some pangolins can eat up to 200,000 ants in one night.

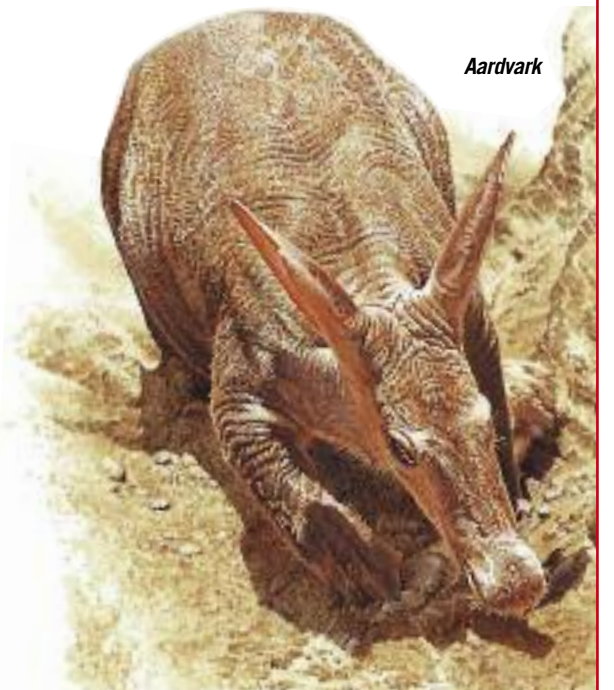
Both aardvarks and pangolins are solitary, nocturnal animals. They use their keen sense of smell to locate good sources of food. They have strong front claws, used for breaking open insect nests, as well as for burrowing (the aardvark) or climbing trees (the pangolin). If threatened, the pangolin will curl up into a ball so that its scales shield it from harm. The aardvark will dig itself into a burrow at top speed.



Woodland hedgehogs make nests out of grass and leaves in the undergrowth.

Some insectivores feed and nest on the surface of the ground, while others, especially moles, live in burrows underground. Otter shrews, which belong to the tenrec family, spend much of their time in water, just like real otters. To defend themselves, hedgehogs and some tenrecs have spines while moles and shrews have foul-tasting skin.

As a mole digs, it pushes the earth up to the surface to form a mole hill.

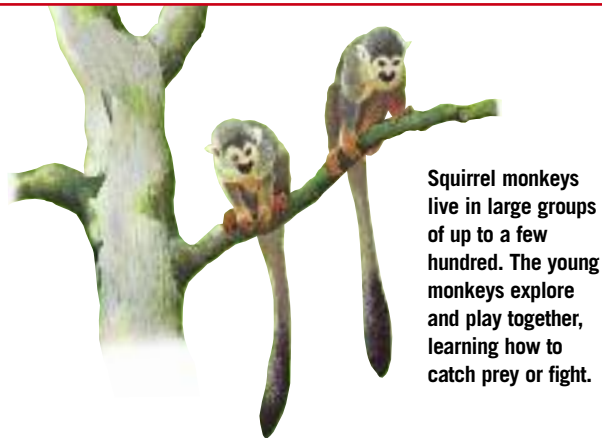


Aardvark

PRIMATES

THE GROUP of mammals known as primates is made up of lower primates (prosimians), such as lemurs and lorises, and higher primates—monkeys, apes and humans. Apart from humans, primates are found in all parts of the world except North America and Australasia.

The lower primates have quite pointed faces, a good sense of smell and smaller brains than the higher primates, who have flat faces, better vision and larger brains.

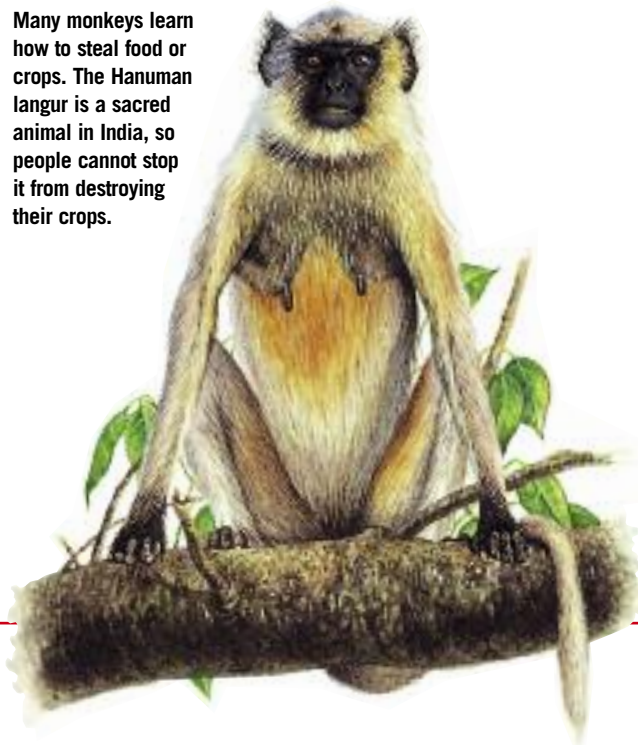


Squirrel monkeys live in large groups of up to a few hundred. The young monkeys explore and play together, learning how to catch prey or fight.

The first group of higher primates are the **monkeys**. All monkeys except marmosets and tamarins have well-developed fingers and toes. They have nails instead of claws, which they use to grasp things and pick up food. Most feed on fruit, leaves, insects and other small creatures. Large monkeys, such as baboons, will kill hares or young deer.

Most monkeys live in trees although some come down to feed or travel. Baboons can walk for long distances on all fours. When in the trees, monkeys leap or swing from branch to branch. The spider monkeys and howler monkeys of Central and South America have prehensile tails. This means they can use their tails like an extra limb, to grasp on to branches and even hang, leaving their hands free to feed.

Many monkeys learn how to steal food or crops. The Hanuman langur is a sacred animal in India, so people cannot stop it from destroying their crops.



APES

All apes have long arms, no tails, and can stand and walk upright on two legs. The lesser apes, the **gibbons**, live in the rainforest of Southeast Asia. They hang from the trees, moving each powerful arm in turn to swing their bodies along.

Chimpanzees, orang-utans and gorillas are known as the great apes. **Chimpanzees** and **gorillas** usually travel along the ground on all fours. Chimpanzees feed both on the ground and in the trees, eating insects, fruit and leaves. They will also hunt and kill monkeys, pigs or deer. Gorillas feed only on ground-level vegetation.

All the great apes make “nests” to sleep in at night. They tear and bend leafy branches to make a platform in a tree or a cushion on the hard ground. A fresh nest is usually built every night. Adults have their own nests but babies sleep with their mothers.



Like all great apes, orang-utans have strong, nimble fingers that they use for grasping and picking things up. However, orang-utans also have feet that are a very similar shape, with the big toe acting as a thumb. This means they can grip branches and climb almost as if they had four arms.

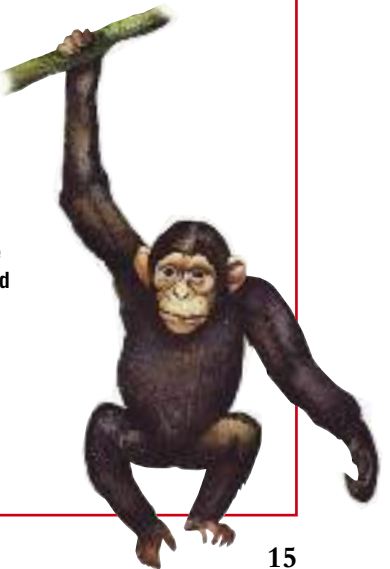
Other great apes use their hands for very precise tasks. A gorilla is able to pick up a small twig with its huge hand, because, like a human's, the thumb can touch each of its fingers. Chimpanzees make tools from sticks to hook termites from their nests.

Orang-utans differ from the other great apes because they spend most of their time in the trees. Their very long arms and hook-shaped hands and feet allow them to climb and swing between branches. Only very large males spend much time on the ground. Orang-utans live alone, travelling through the Southeast Asian rainforest in search of fruit to eat.

The great apes are the closest relatives to humans. They are able to use tools, solve problems and learn quickly. They live in societies that are often similar to our own. However, like many other animals, the survival of the great apes is threatened by hunting and the destruction of the great rainforests of Africa and Asia.

Gorillas (*left*) live in the rainforests of central Africa. Adult males are known as silverbacks because of their “saddle” of silver hair.

Gorillas live in small but stable groups, usually of one male and several females and young. Chimpanzees (*right*) belong to large communities, but spend much of their time alone. Male chimpanzees will also form gangs that fight each other.



Most of the lower primates are tree-dwellers that leap or climb from branch to branch feeding on fruit, insects or leaves. Some will also catch small reptiles, birds or bats. They usually have long tails to help them balance on landing.

Bush babies, **lorises** and **tarsiers** are nocturnal. Bush babies and tarsiers move quickly through the trees by running or leaping, while lorises move slowly and carefully. They will freeze and not move again for hours on end if they sense danger.

Lemurs are the largest group of lower primates, but they are found only on the island of Madagascar off the African coast. Most lemurs have long, bushy tails and soft coats, often with striking markings. When on the ground most lemurs move on all fours, but indris and sifakas bound along on their hind legs.

RODENTS

RODENTS include mice, rats and squirrels, as well as beavers and porcupines. They are a very large group of mammals that live almost everywhere in the world, from the freezing Arctic to the hottest deserts. They are so successful because they can adapt easily to new environments, survive on many different kinds of food and breed very quickly.

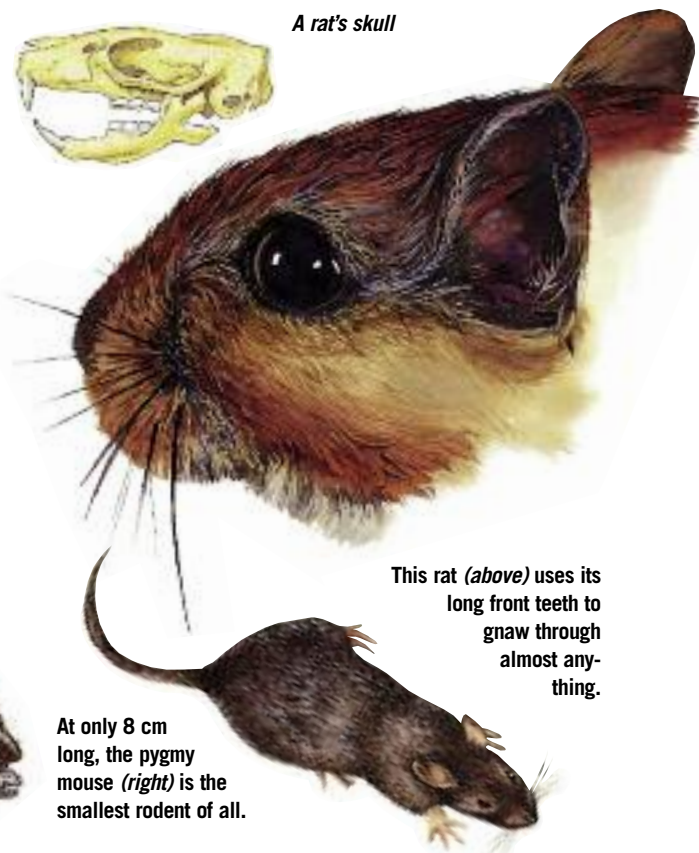
Unfortunately, rodents often come into close contact with humans, and can become pests. They eat and contaminate vast quantities of crops, stored grain and household food, and also spread diseases.

Some rodents, such as this chipmunk, have folds of skin called cheek pouches on either side of their mouths, into which they stuff food to be eaten later in safety.



Rodents are usually small animals, with short legs and a tail that may be either long or barely visible. They are intelligent, and have keen senses of smell and hearing. They also use their sensitive whiskers to find out about their surroundings. All rodents have a set of grinding teeth and two pairs of large, sharp front teeth for gnawing.

Beavers are famous for building dams across streams with sticks and mud to create their own ponds.



A rat's skull

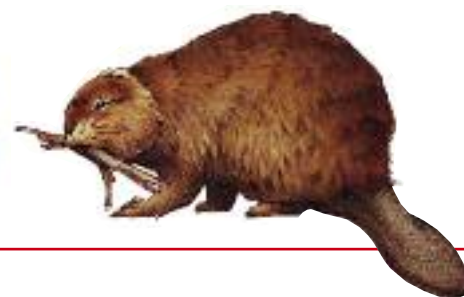
This rat (above) uses its long front teeth to gnaw through almost anything.

At only 8 cm long, the pygmy mouse (right) is the smallest rodent of all.

Rodents feed mainly on plant material including nuts, seeds, fruits, leaves, bark and wood. Their front gnawing teeth keep growing all the time to avoid getting worn down by such a tough diet.

Most kinds of rodents live in groups, from small families of beavers to large colonies of ground squirrels or prairie dogs. Many live underground, but others, such as tree squirrels and flying squirrels, nest in trees. Harvest mice weave tiny grass nests between tall reeds or stems. Like some monkeys, they have prehensile tails (see page 14) that can grasp the stems.

The lifespan of the smaller rodents is short, often only one or two years in the wild. However, they breed from a very early age and can have many young at once.



As well as rats, mice and squirrels, the rodent group contains voles, cavies (also known as guinea pigs) and larger animals such as porcupines, capybaras and coypus.

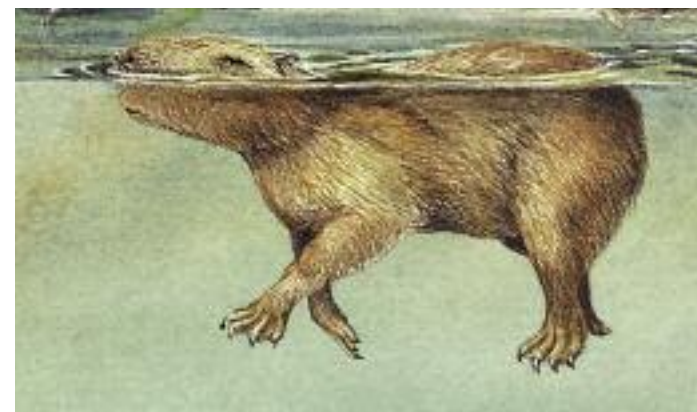
Porcupines of the Americas live mostly in trees, while those of Africa and Asia are ground-dwellers. However, they both possess a set of sharp spines and hollow quills. If threatened, the porcupine will run backwards into its attacker, leaving several quills embedded in its attacker's skin.

North American porcupine



Capybaras, the largest rodents, and their relatives, the coypus, are very good swimmers. Coypus feed in the water, while capybaras leap in to escape from predators.

Capybara



LAGOMORPHS

THE WORD lagomorph means "hare-shaped". The group includes rabbits, hares and pikas. All lagomorphs have long soft fur all over their body, even on their feet. They feed mainly on grasses, but also eat leaves, bark, seeds and roots.

Lagomorphs are prey to many animals, so they have large ears to listen for danger and eyes on either side of their head, allowing them to see a wide area around them. Rabbits dig burrows where they sleep and give birth. They are also a place to escape from predators. Some pikas also live in burrows, while others shelter in crevices between rocks. Hares and their young rest in small areas of flattened grass called forms.

The snowshoe hare gets its name from its fur-covered feet which help it to run on the snow. It has a grey-brown coat in the summer which turns white in winter.



To escape from predators, hares use their long, strong legs which can carry them at speeds of up to 80 kilometres per hour.

Like rodents, lagomorphs can breed very quickly and have many young at once. This means that where there are not enough predators, they can become pests.

Pikas store food for the winter by piling up grass near their burrows. This will later turn into hay.



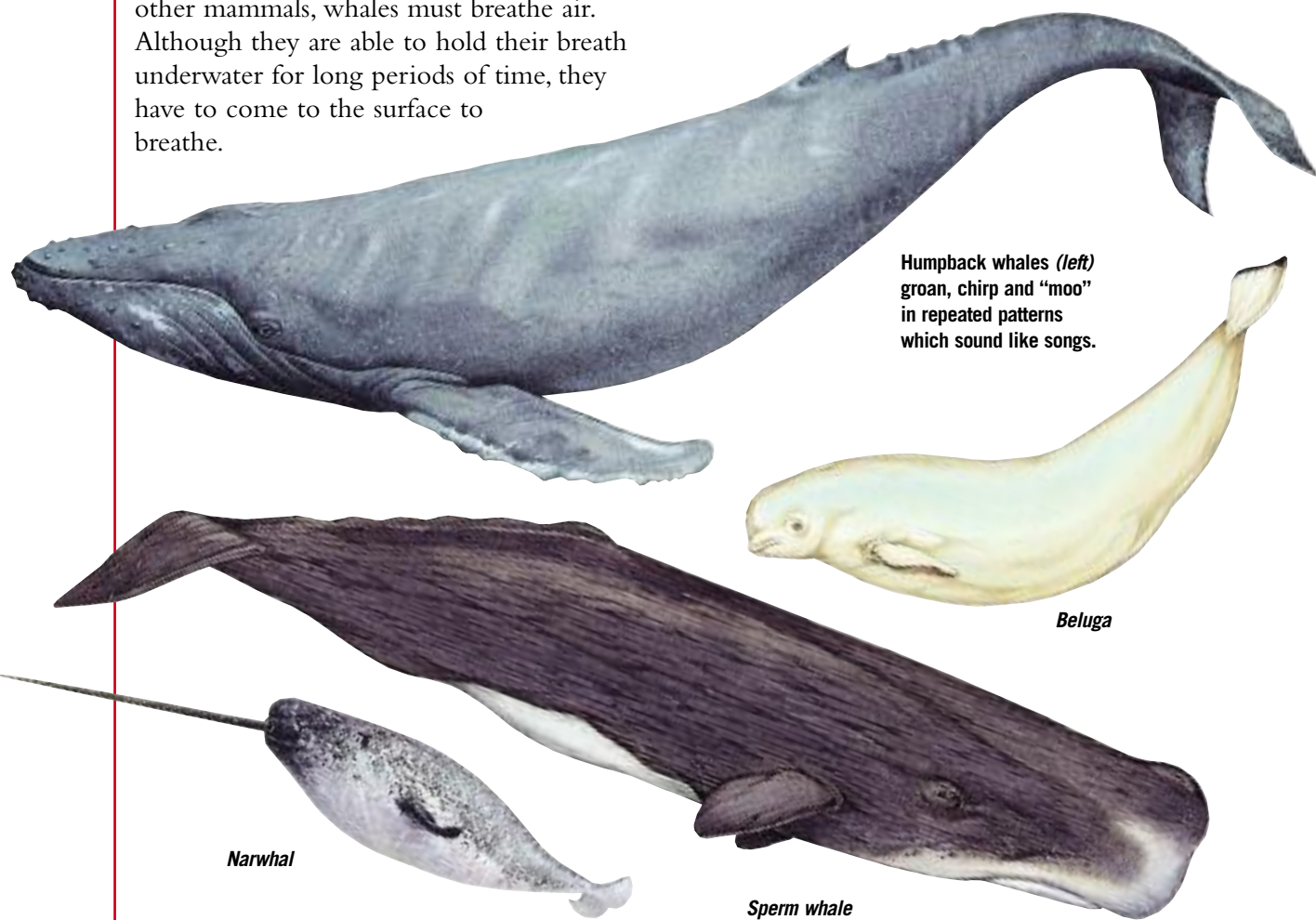
CETACEANS

CETACEANS are carnivorous mammals that live permanently in the water. The group is made up of the whales, dolphins and porpoises.

Whales have a long, streamlined shape with no hair or fur on their bodies, so that they can swim quickly and easily. They also have a thick layer of fat called blubber to keep them warm in cold waters. Like all other mammals, whales must breathe air. Although they are able to hold their breath underwater for long periods of time, they have to come to the surface to breathe.

Despite their huge size, most great whales feed on tiny creatures called zooplankton, which float through the oceans in great masses. The whales take in mouthfuls of water and filter out the zooplankton through plates of horn-like material, called baleen, in their mouths. Some will also feed on schools of tiny fish using this method.

Other whales such as the sperm whale or the beluga, have many small, peg-like teeth. These whales feed mainly on fish or squid.



Whales are the largest animals in the world. In fact, the enormous blue whale, which can measure over 30 metres long, is probably the biggest animal that has ever lived. Whales are able to grow so large because their huge weight is supported by the water. If a land animal grew to this size, its legs would collapse under the weight of its own body.

The sperm whale preys on giant squid. It is able to dive to depths of over 3000 metres and stay underwater for over an hour in search of its deep-dwelling prey.

There is little light underwater, so most whales find their way using echolocation, in the same way as bats (see page 12). They communicate with one another using clicks, squeals and moans.

DOLPHINS

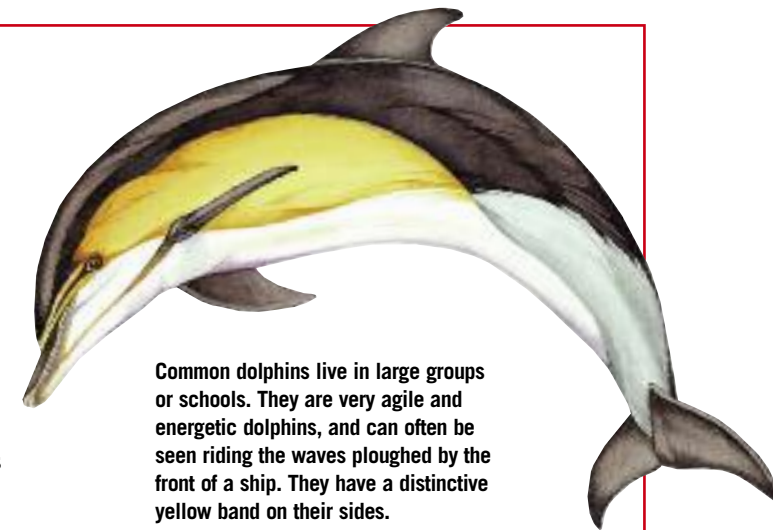
Dolphins also live in water all the time, but they are smaller than the whales. They all have teeth and feed mostly on fish or squid, which they are able to chase through the water at speed. The largest member of the dolphin family, the orca or killer whale (below), also feeds on sea mammals such as seals or even whales.

Dolphins range in size from just over one metre, to the orca which can be nine metres



in length. They have a backward-curving dorsal (back) fin, and many have beak-like snouts. Most dolphins live in the oceans, but a few live in large rivers.

Like most whales, dolphins use echolocation to navigate through the water. This also helps them to find shoals of fish or squid. The few species of dolphin that live in the long rivers of India, China and South America, are almost blind and rely completely on echolocation to find their way through the muddy waters.

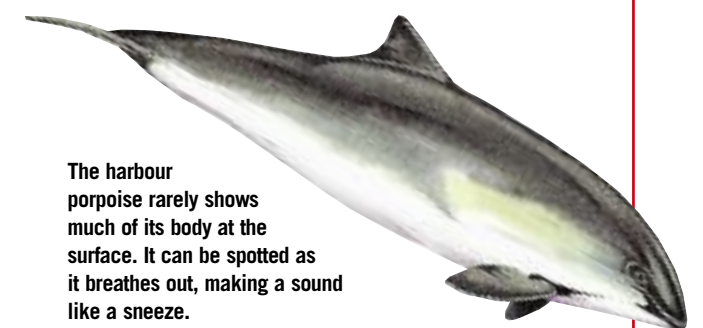


Most dolphins are social animals. They often form large groups which can number several hundred. Dolphins will frequently move between groups, but some species, such as the orca, form small, stable families.

Dolphins are intelligent, inquisitive animals. Some kinds will often swim beside boats or come up to investigate us if we enter the water. Dolphins are famous for their acrobatics, leaping and twisting up out of the water. This may be a way of taking in air quickly while swimming at top speed, signalling, or maybe just having fun.

PORPOISES

Porpoises are smaller than dolphins, and have blunt snouts. They have small, flattened teeth rather than the pointed teeth of dolphins. Porpoises usually live alone or in small groups. Most are shy animals that stay below the surface of the water as much as possible. This means that they are rarely seen by humans.





Walrus use their long tusks for fighting.

PINNIPEDS AND SIRENIANS

THE NAME given to the group of mammals that includes seals and sea lions is pinnipeds, which means “wing-footed”. It is a good description for these animals, clumsy on land but agile and graceful in the water.

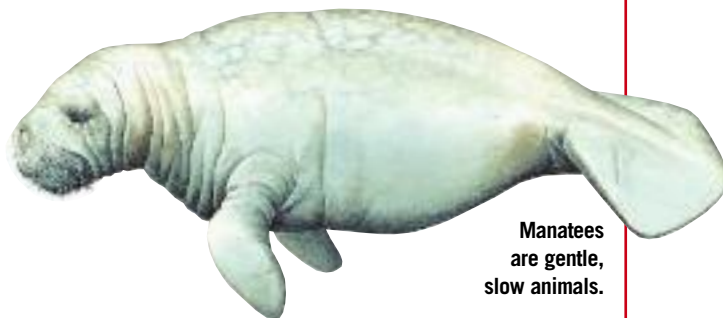
Seals and sea lions spend most of their time in the ocean waters, but, unlike whales and dolphins, they also come out on to land to breed and suckle their young. Their four limbs have developed into flippers that propel them through the water at speed.

Walrus also belong to the pinniped group. They are large, slow-swimming Arctic mammals with huge tusks.

Seals and sea lions can be divided into the eared seals, which include all sea lions and the fur seals, and the true seals (all other seals). The eared seals are so called because they have small ear flaps.

True seals have short front flippers but powerful hind flippers, which they use to propel themselves through the water. When on land they shuffle along on their bellies. Eared seals have long, strong front flippers that support their bodies when on land. In the water, they use these flippers like oars to pull themselves along.

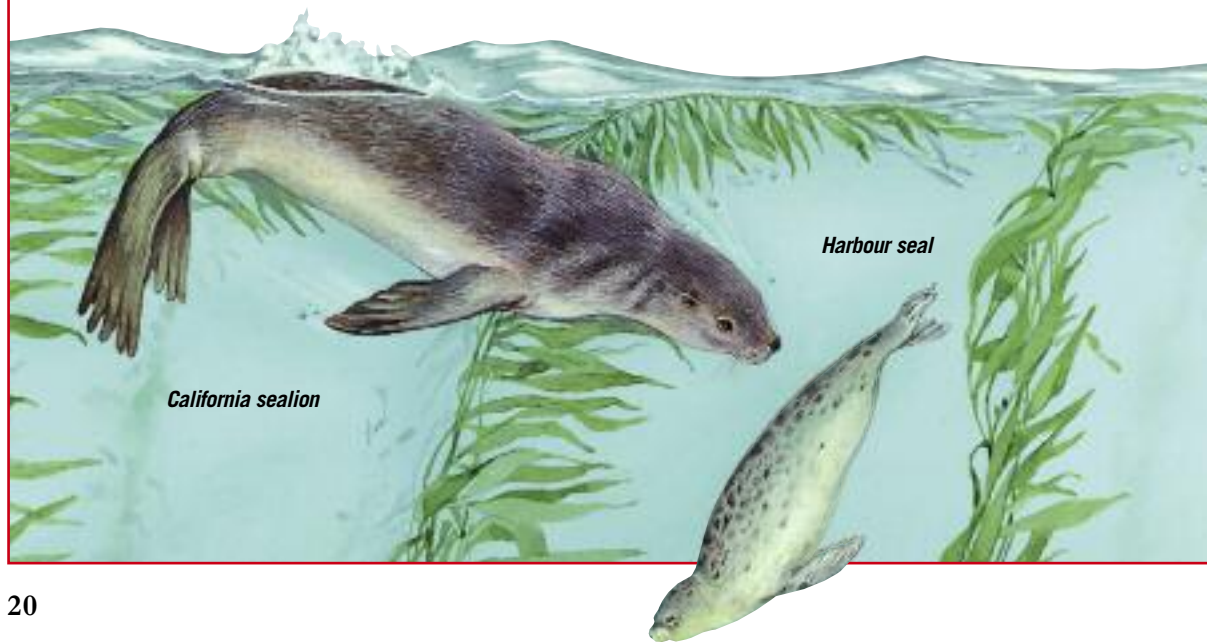
Seals and sea lions feed on fish, squid, krill and other small sea creatures. Some also eat birds and even the young of other seals.



Manatees are gentle, slow animals.

SIRENIANS

Like cetaceans, sirenians—manatees and their relatives, the dugongs—are mammals that live in water all the time. They have large, bulky bodies and live in tropical coastal waters and rivers. Manatees and dugongs feed only on water plants.



Harbour seal

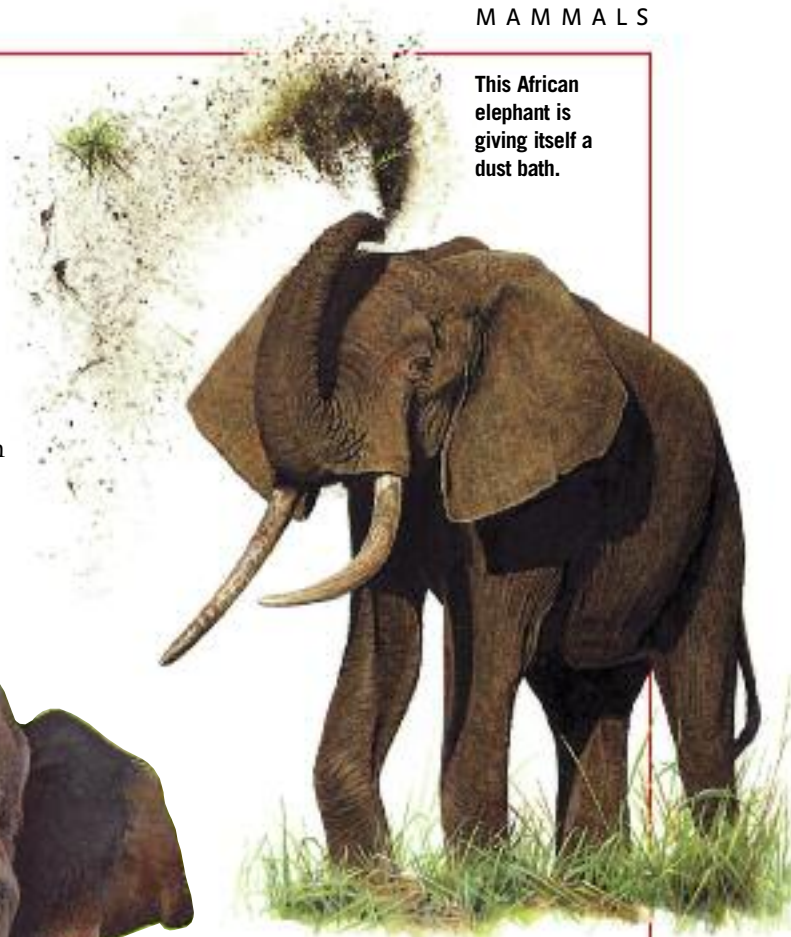
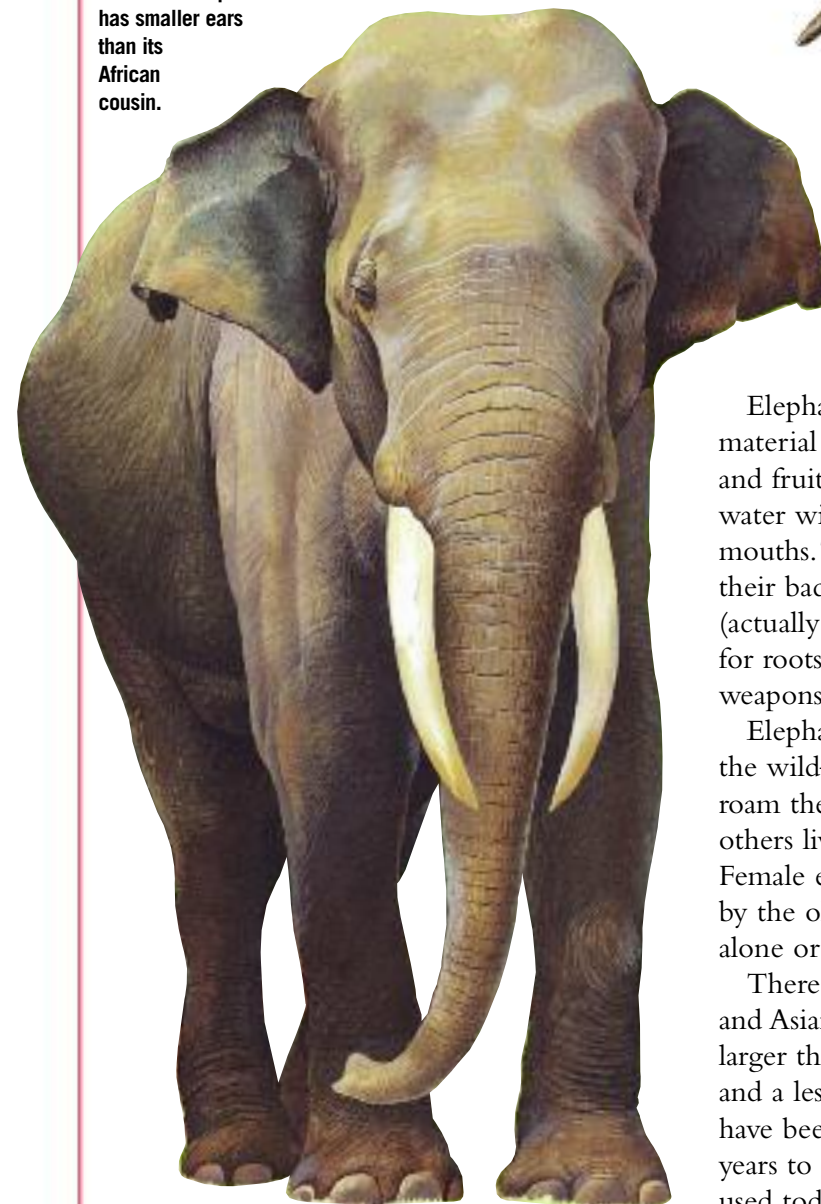
California sea lion

ELEPHANTS

THE LARGEST animals on land today, elephants share the same distant ancestor as the manatees and dugongs. They are famous for their huge size, their tusks and of course, their long trunks.

The strong, flexible trunk is actually an extended nose and top lip. Though mainly used for feeding, it is also useful for bathing and for communicating with others through touch. Using its trunk, an elephant can reach down to the ground to drink or up into the trees to pull down branches.

The Asian elephant has smaller ears than its African cousin.



This African elephant is giving itself a dust bath.

Elephants feed on all types of plant material including grasses, leaves, branches and fruits. They pick up food or suck up water with their trunks and put it into their mouths. They can also spray water over their backs to cool themselves off. The tusks (actually long front teeth) are used to dig for roots or peel bark from trees, and also as weapons in fights between males.

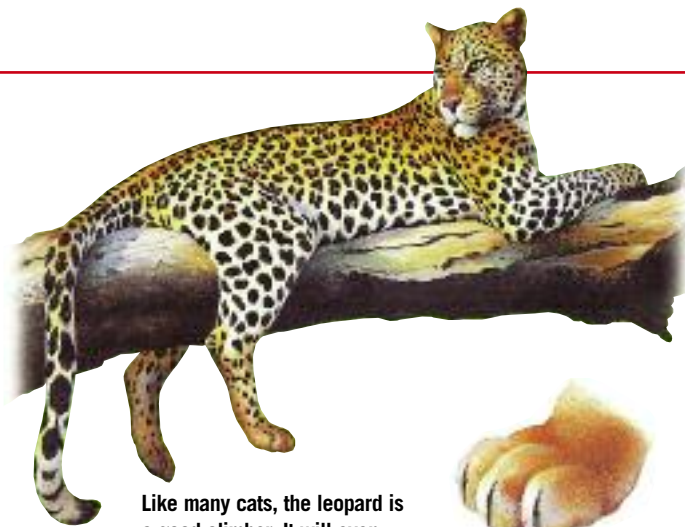
Elephants can live for up to 60 years in the wild—almost as long as humans. Many roam the open grasslands of Africa, but others live in forests or mountainous areas. Female elephants stay in family groups led by the oldest female, while males travel alone or in small bands.

There are two kinds of elephants: African and Asian elephants. African elephants are larger than Asian elephants, with bigger ears and a less rounded back. Asian elephants have been used by humans for thousands of years to carry heavy loads. They are still used today in the logging industry.

CARNIVORES I

THE WORD carnivore usually describes animals that feed on meat, but not all meat-eaters belong to the carnivore group, nor do all carnivores eat meat.

Carnivores include cats, dogs, and bears as well as weasels, raccoons and mongooses. Most are meat-eaters, but others feed on insects and fruit and some eat only plants. They are grouped together because they are all descended from mammals that had specially shaped teeth for cutting through flesh. Many of the meat-eating carnivores still have these teeth, but in others they have been adapted for grinding plant material.



Like many cats, the leopard is a good climber. It will even drag its kill up into a tree.



A tiger's claws spring out when it leaps on to its prey.



Carnivores have keen senses, especially their sense of smell. Scent is used to mark their territory or to communicate with others. Many live in packs, hunting together and even helping to raise the young.

Small cats often live in isolated areas, as far away from humans as possible. Many, such as this bobcat, have beautifully spotted coats that help them to blend into the background when hunting.



The **cat** family is made up of the big cats such as lions, tigers and leopards, and the small cats, such as the ocelot, bobcat and the domestic cat. They feed only on meat, and are superbly adapted for hunting.

Cats have excellent hearing and vision, and can see in the dark. Their feet have soft pads for creeping up silently on their prey. Their sharp claws can be drawn in when walking to stop them from becoming blunted on the ground.

Although lions are well-known for living in groups, or prides, most cats in the wild are secretive animals that usually live and hunt alone.

The **dog** family includes wolves, foxes and wild dogs. Domestic dogs are descended from wolves. Like the cats, dogs are built for hunting. Their long, strong legs can carry them great distances in search of food. Small prey are grabbed in the jaws or pounced on first with the front feet. Larger prey are chased down then pulled to the ground and killed.

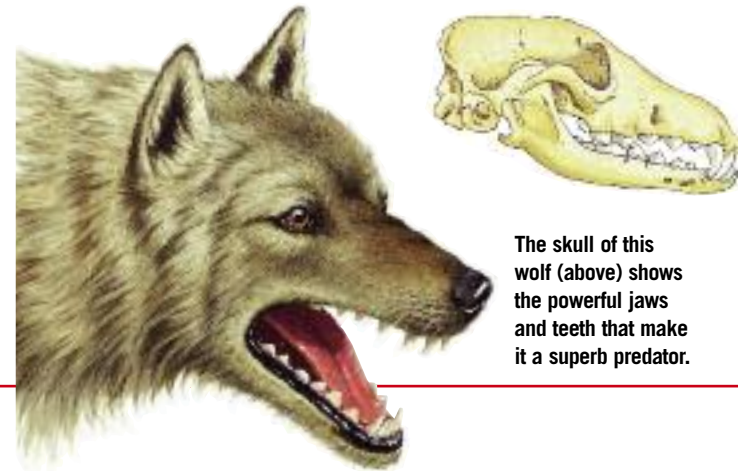
Dogs are able to adapt easily to different conditions, living in the hottest and the



Besides woodlands, red foxes live in cities, where they eat rodents and food scraps.

coldest of environments. They also have a more varied diet than the cats, feeding on almost anything they can find, including fish, fruit and even insects, as well as meat.

Most kinds of dogs live together in family groups. A pair of Arctic wolves will form a breeding partnership that can last for life.

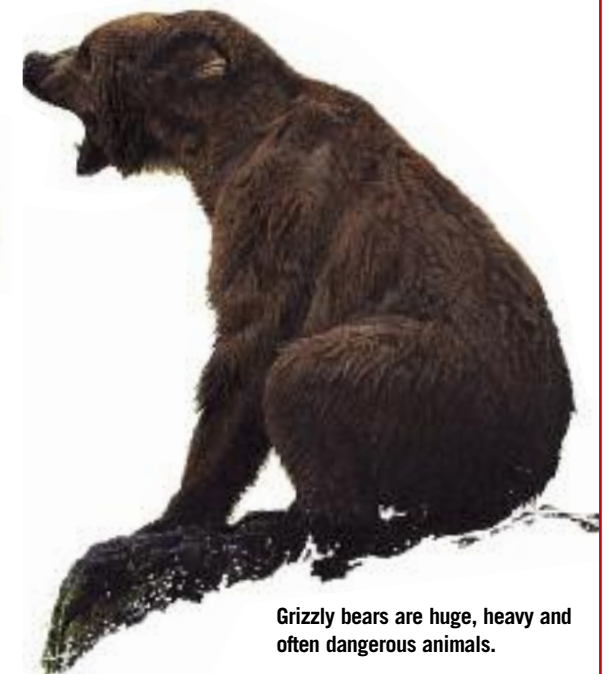


The skull of this wolf (above) shows the powerful jaws and teeth that make it a superb predator.

Their young leave to make their own family groups when they become adults. African wild dogs form large packs where young males are allowed to stay with the pack while their sisters must leave to find a new one. Pack hunters work together to hunt down large prey, and also help to feed and look after the young.

In contrast, another group of carnivores, the **bears**, lead a mainly solitary life. Bears are large, heavily built mammals which, despite their short legs, can run at speed. They include the largest carnivores on land, the polar bear and grizzly bear.

Bears have poor eyesight but an excellent sense of smell. Most bears are mainly plant-eaters, but they also feed on fish, small animals and insects. They will eat meat killed by other carnivores, and even catch some prey themselves. The exception is the polar bear, which feeds mostly on seals since there is little vegetation in the icy Arctic.



Grizzly bears are huge, heavy and often dangerous animals.

Most bears live in forests, and the smaller bears such as the black bear or sun bear are good climbers. Bears that live in northern climates spend the winter in caves or in dens dug under the snow. They live off the food they stored as fat in the summer. During the winter, the females give birth.

CARNIVORES II

SOME of the most effective hunters among the carnivores are actually the smallest. The weasels, for example, are fearsome fighters, able to kill prey much larger than themselves. The fisher marten of North America preys on the formidable porcupine, while a wolverine can bring down a reindeer.

The **weasel** family includes weasels, polecats and martens, skunks, otters and badgers. They are generally small animals, though the giant otter can measure over 1.8 metres from nose to tail. They have long



The least weasel, only 18 cm long, is the smallest carnivore. It can follow mice into their burrows.

bodies with short legs and often a long tail, and can be found on and under the ground, in the trees and in the water.

Most members of the weasel family feed on smaller mammals, especially rodents, but some will also eat worms, fruit, and insects. The honey badger breaks open beehives to reach the honey inside, while otters feed on fish, frogs and other water creatures. The sea otter uses a stone to crack open shellfish.

Eurasian badger



Sea otters anchor themselves in kelp, a seaweed, while they sleep.

Many members of the weasel family can produce a foul-smelling liquid called musk, both to mark their territories and to defend themselves against predators. The best-known of these is the skunk. If threatened, it will turn its back on its attacker and spray musk for distances of up to seven metres.

Apart from some otters and badgers, members of the weasel family are solitary mammals, keeping to their own territories and fight. Males and females usually come together only to breed.



Striped hyena

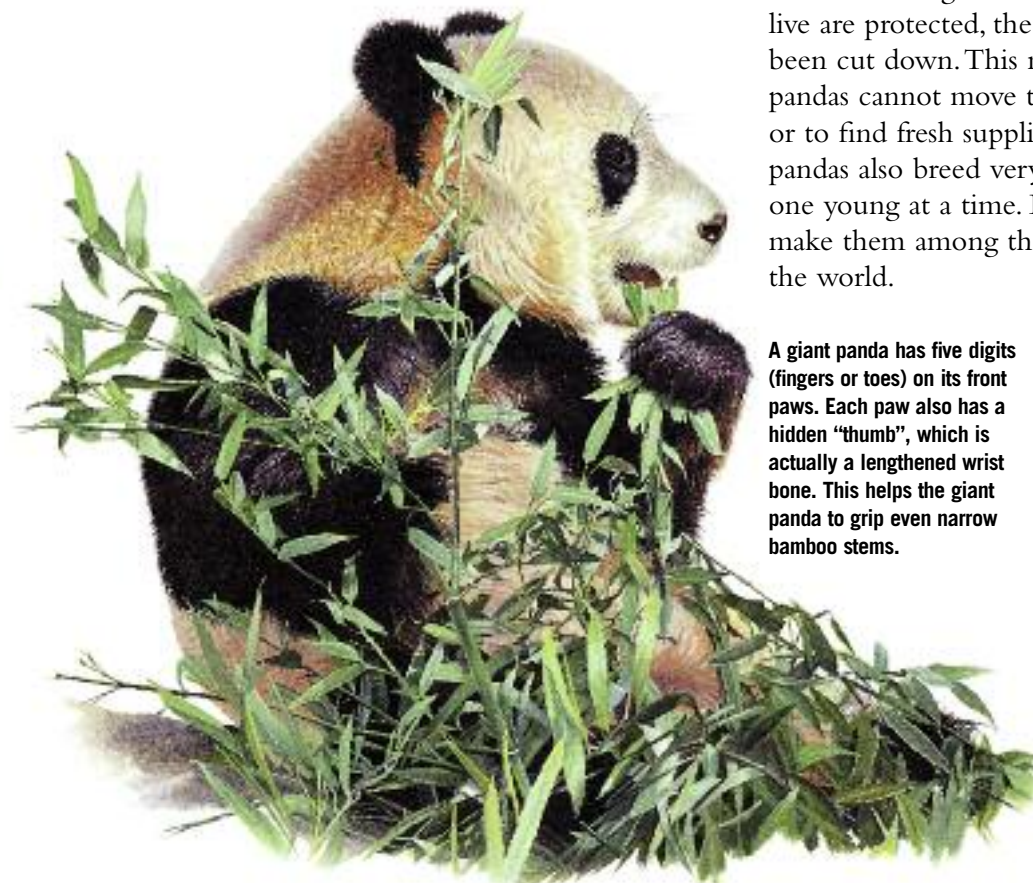
Although **hyenas** look as though they should belong to the dog family, they are actually a separate group of carnivores. Most hyenas are meat-eaters. Some live in groups and hunt or feed together. They can kill large prey such as wildebeest after chasing them for several kilometres. A hyena's strong jaws and large teeth can crush even large bones, horns and hooves, making sure there is little left after a kill.

The aardwolf differs from other hyenas because it is nocturnal, solitary, and feeds not on meat but on termites.

The carnivore group also includes the mongoose family and the raccoon family, many of which do not rely on meat in their diets. The **mongoose** family (civets and genets and mongooses) are mostly solitary animals, but some, such as the meerkats, live in large groups. While feeding above ground they all watch out for predators, and will even band together to drive them away.

The **raccoon** family includes raccoons, coatis and pandas. All except the giant panda are quite small animals with long tails. They are good climbers, and some feed and nest in trees. Most members of the raccoon family live alone and are nocturnal, apart from coatis which form groups of females and feed during the day.

Raccoons and coatis feed on a wide range of foods including rodents, insects, frogs, plants and fruits. Red pandas, the smaller, lesser-known relatives of the giant panda, feed on fruit, bamboo and other plant material, while giant pandas themselves usually feed only on bamboo.



The kinkajou is a member of the raccoon family. It lives in the forests of Central and South America, feeding on fruit, nectar and honey with its very long tongue. Like most of the raccoon family it is nocturnal.



Giant pandas are solitary animals that live in bamboo forests in the mountains of China. Although the small areas where they live are protected, the surrounding forest has been cut down. This means that giant pandas cannot move to a new area to breed or to find fresh supplies of bamboo. Giant pandas also breed very slowly, raising only one young at a time. Both of these factors make them among the rarest mammals in the world.

A giant panda has five digits (fingers or toes) on its front paws. Each paw also has a hidden "thumb", which is actually a lengthened wrist bone. This helps the giant panda to grip even narrow bamboo stems.



Giant pandas have to spend most of their day eating bamboo, to get enough nourishment to survive.

UNGULATES I

UNGULATES are a group of mammals that have hooves instead of claws on their feet. They are all quite large, with long faces and good senses of smell and sight. Most ungulates have a coat of coarse hairs rather than soft fur. They are all plant-eaters, taking food straight from the plant or the ground with their lips, teeth and tongue.

Ungulates have large, flat teeth for grinding down plant material, and specially-adapted digestive systems to get as much nourishment as possible from their food. Because of their large size, many ungulates have to spend most of their time eating.

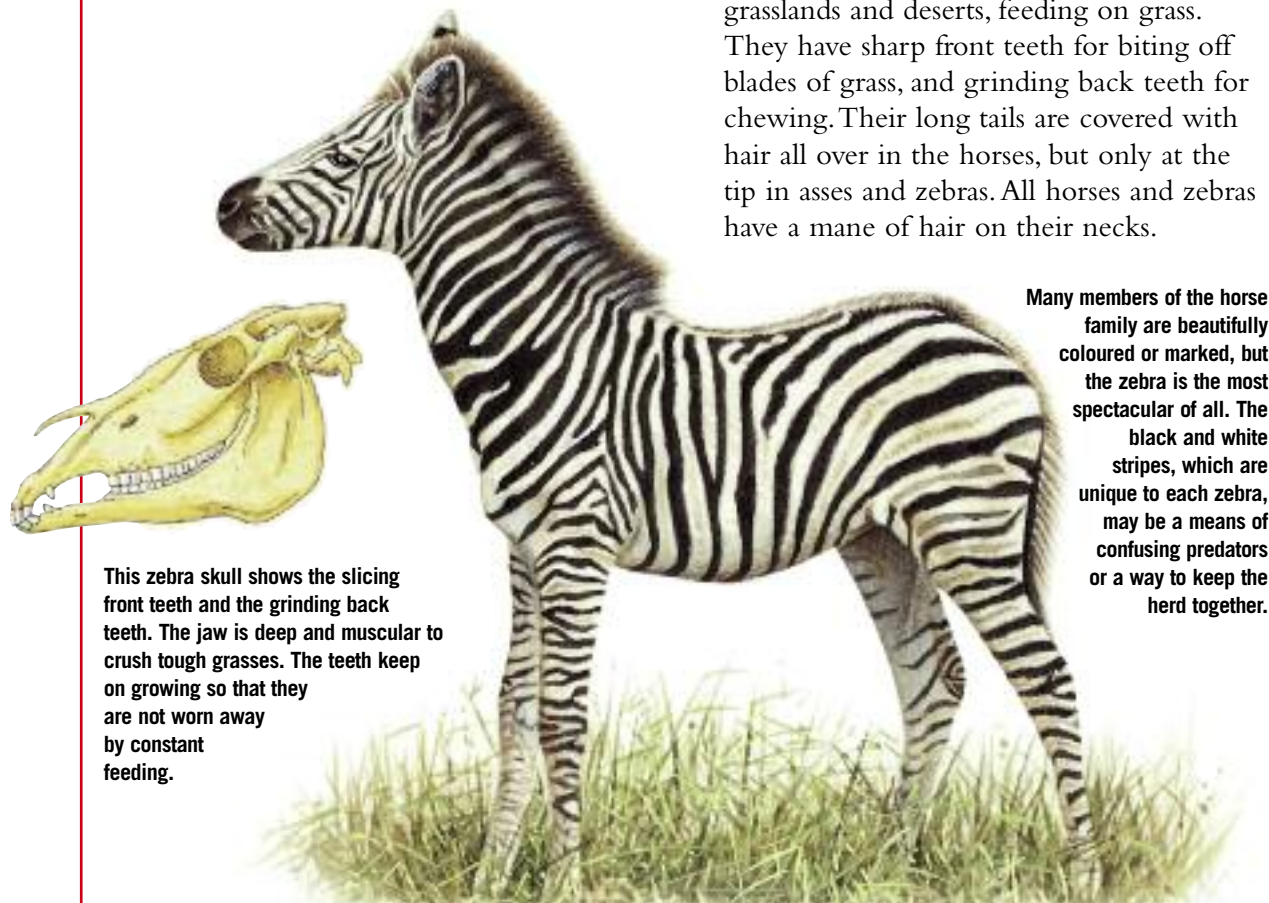
Ungulates have evolved to walk on their toes, which have become hard hooves. This gives them speed to escape from danger. Ungulates that live in forests and have to search for their food are often solitary, while those that live in open spaces and feed on abundant plants such as grasses tend to live in herds.



Malayan tapir

Ungulates are divided into two groups: the odd-toed ungulates, which have one or three toes, and the even-toed ungulates, which have two or four toes. The odd-toed ungulates include horses and zebras, which have a single toe, and rhinoceroses and tapirs, which have three toes on each foot.

Horses, asses and zebras live in grasslands and deserts, feeding on grass. They have sharp front teeth for biting off blades of grass, and grinding back teeth for chewing. Their long tails are covered with hair all over in the horses, but only at the tip in asses and zebras. All horses and zebras have a mane of hair on their necks.

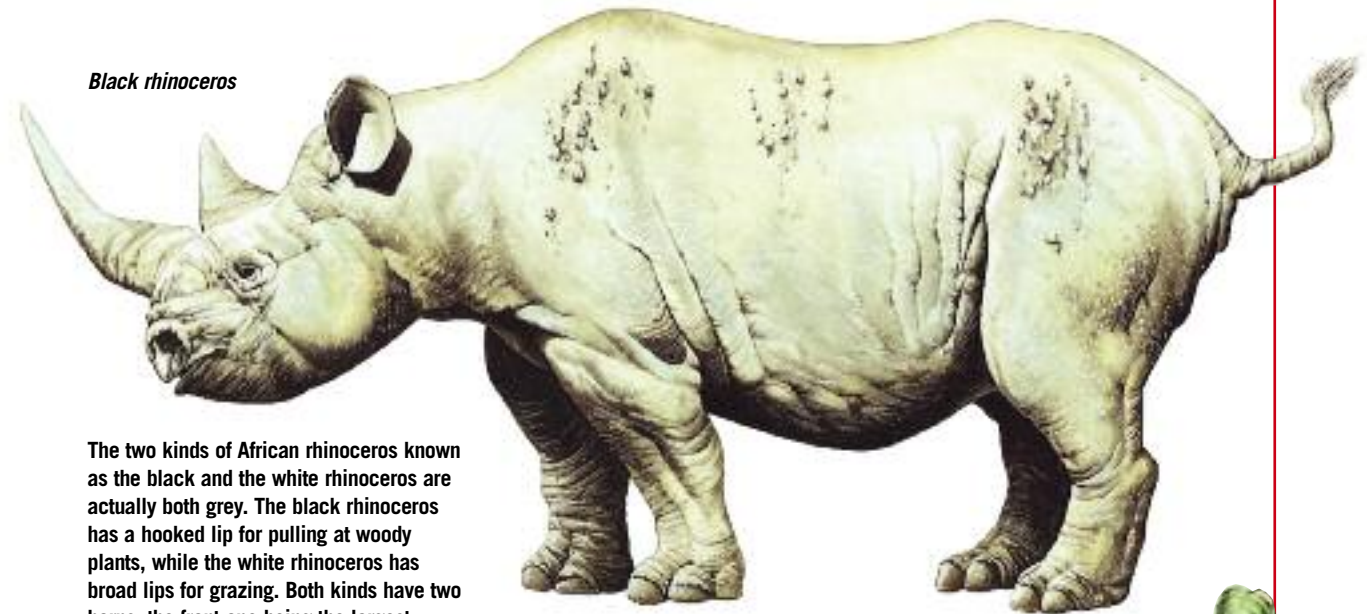


This zebra skull shows the slicing front teeth and the grinding back teeth. The jaw is deep and muscular to crush tough grasses. The teeth keep on growing so that they are not worn away by constant feeding.

Many members of the horse family are beautifully coloured or marked, but the zebra is the most spectacular of all. The black and white stripes, which are unique to each zebra, may be a means of confusing predators or a way to keep the herd together.

Horses have excellent eyesight and can spot a predator in almost any direction. They can also run at top speed for long distances. Where food is plentiful, they live in herds consisting of a male and a group of females and their foals. Male horses or zebras will fight for the right to lead a herd.

The **tapir** family is one of the oldest in the world. Tapirs are found in the forests of Central and South America and Southeast Asia. They use their small trunks to sniff out leaves and pull them towards their mouths.



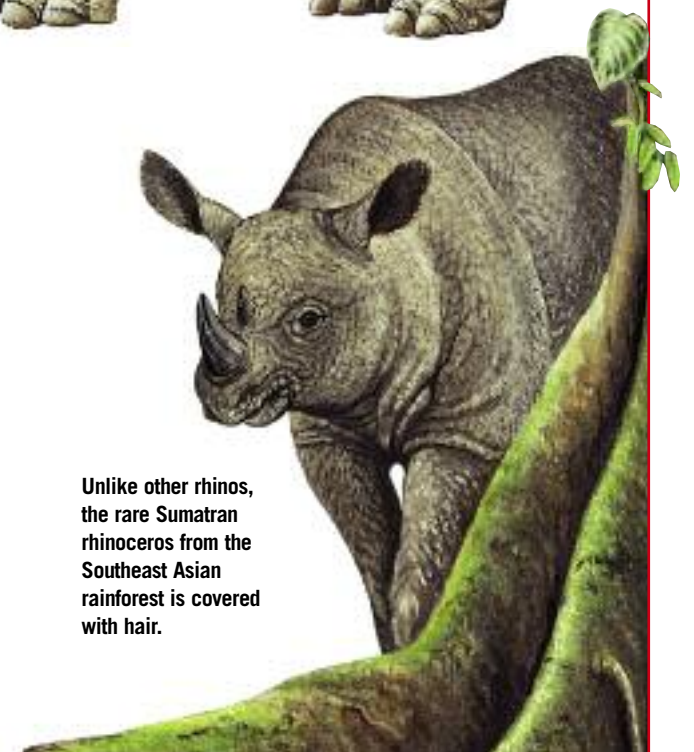
Black rhinoceros

The two kinds of African rhinoceros known as the black and the white rhinoceros are actually both grey. The black rhinoceros has a hooked lip for pulling at woody plants, while the white rhinoceros has broad lips for grazing. Both kinds have two horns, the front one being the largest.

Tapirs are nocturnal animals, and rely on their dark colouring to camouflage them among the trees and protect them from predators. The Malayan tapir has large patches of black and white that break up its outline in the darkness. The natural enemies of tapirs are big cats such as the jaguar, but humans are also threatening them by destroying much of their habitat.

Rhinoceroses form the third group of odd-toed ungulates. Their huge bodies are armoured with thick skin, and they have one or more horns on their heads. These are actually made from a hardened material called keratin, similar to that found in our fingernails. Several kinds of rhinoceros are in danger of dying out because of hunting by humans for their horns.

Unlike most other ungulates, rhinoceroses have poor eyesight, but their hearing and sense of smell is good. They are mainly solitary animals, though they may sometimes form small groups. White rhinoceroses graze on short grass while other kinds prefer to browse on woody plants, leaves and fruits. The browsers have a prehensile upper lip, to grasp food more easily. Rhinoceroses like to be near water to keep cool. They roll in the mud to protect their skin from biting insects.



Unlike other rhinos, the rare Sumatran rhinoceros from the Southeast Asian rainforest is covered with hair.

UNGULATES II

THE EVEN-TOED ungulates include a wide variety of large mammals from pigs and sheep to giraffes and antelopes. There are two main groups of even-toed ungulates. The first group is made up of the pigs, peccaries and hippopotamuses, which have short legs, large heads and four toes on each foot. The second group comprises all other even-toed ungulates, which have longer legs and two toes on each foot.



Peccary

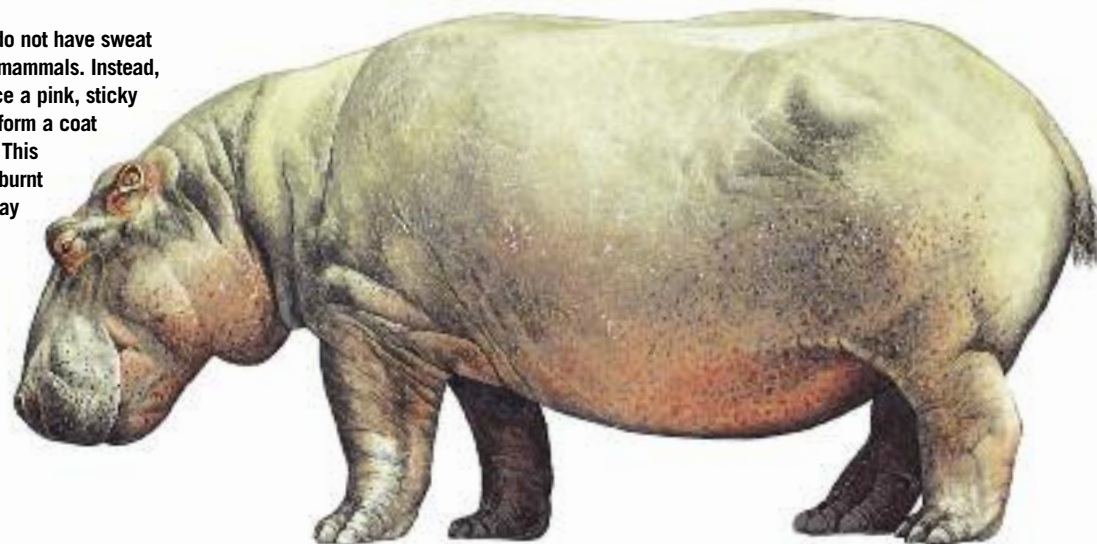
Wild pigs and peccaries feed on a wider variety of foods than other even-toed ungulates. Wild boars use their large, mobile snouts to sniff out and unearth plants, fruits, worms, roots and even small animals such as frogs and rodents. Other wild pigs eat grasses while peccaries feed mostly on roots, fruit and seeds.

Wild pigs usually live in small groups of males or females and their young, though larger groups may come together to feed. Peccaries live in large social herds that are then divided into smaller family groups including males, females and young. Peccaries will defend their territory against intruders and risk their lives to protect the herd from a predator.

Hippopotamuses are large African mammals. The hippopotamus lives in groups in grassland rivers and lakes, while its smaller, more solitary relative, the pygmy hippopotamus, lives in forests and swamps.

Wild **pigs** and **peccaries** have stocky bodies covered with bristly hair, and large canine teeth, which in some kinds, such as wild boars and warhogs, curve upwards to form tusks. They are larger in males, and are used for fighting. Thick skin and pads of matted hair on the shoulders protect each male from its opponent's tusks.

Hippopotamuses do not have sweat glands like other mammals. Instead, their pores produce a pink, sticky fluid that dries to form a coat over their bodies. This stops them being burnt by the sun, and may also prevent any wounds from becoming infected in dirty water or mud wallows.



The skin of a hippopotamus dries out quickly in the hot African sunshine, so they spend the daytime lazing in cool water or mud. Their eyes, ears and nostrils are high on their heads, so they can submerge almost their entire bodies. At night, as the air cools down, they come out on to land and graze on short grasses for a few hours. Because they spend little time moving about, they do not need to eat for long periods every day as other large ungulates do.

However, despite their lazy appearance, hippopotamuses are powerful animals that will fight fiercely for territory or to defend their young. They can inflict serious injuries with their long, sharp, lower canine teeth on anything that threatens them.

Most camels are now domesticated by humans, though they still roam freely for much of the time, living in herds and feeding for themselves. They have been used for thousands of years by humans as beasts of burden, carrying goods and people for many miles. Their meat, wool and milk is also valued by their owners.

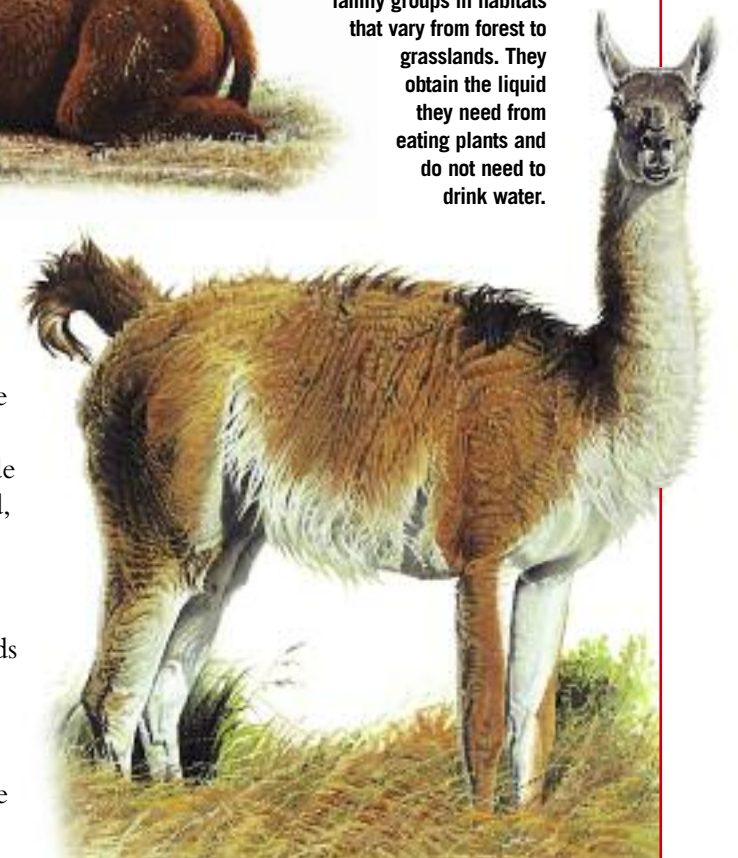
The smaller members of the camel family live in the Andes mountains of South America. They are agile, long-legged animals that feed on grass or browse on plant material. The llama and alpaca are domesticated. Llamas can carry heavy loads for miles across rough terrain, while alpacas are bred for their fine wool. The guanaco and vicuña live in wild groups. They are also prized for their wool, which means that they are vulnerable to hunters.



The dromedary has only one hump, while the Bactrian camel (left) has two. It also has a thick woolly coat in the winter that it sheds in spring, giving it a tattered appearance.

Camels are two-toed ungulates. The camel group includes two species of camel and several South American species such as llamas and vicuñas. They live in deserts or mountainous plains, and have adapted to be able to survive in these harsh conditions.

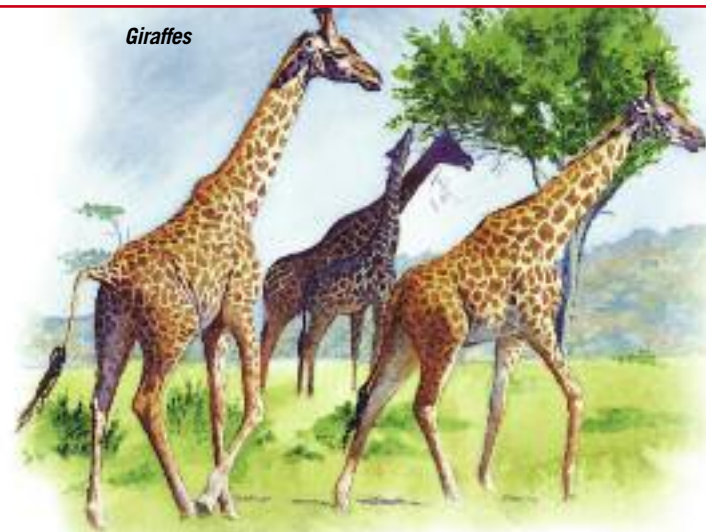
Camels are desert animals. Their flat, wide feet help them to walk easily over soft sand, and they can even close their nostrils to stop sand blowing in. Camels will eat dry, thorny plant material that other animals would not, and they can go for long periods without food or water. Their humps are actually food stores in the form of fat, and their bodies conserve as much water as possible. When they do drink, they can take in large volumes of water in a short time.



Guanacos (below) live in family groups in habitats that vary from forest to grasslands. They obtain the liquid they need from eating plants and do not need to drink water.

UNGULATES III

MANY of the ungulates are able to digest their food more efficiently than other animals. This means that, despite their large size, they can get the nourishment they need from their plant-eating diets. These animals are known as ruminants, and include camels, giraffes, deer and bovids (cattle, antelopes, sheep and goats). Their stomachs are divided into compartments that break down tough food in stages. In some ruminants, such as cattle, the food is sent back to the mouth to be chewed again after the first stage of digestion.

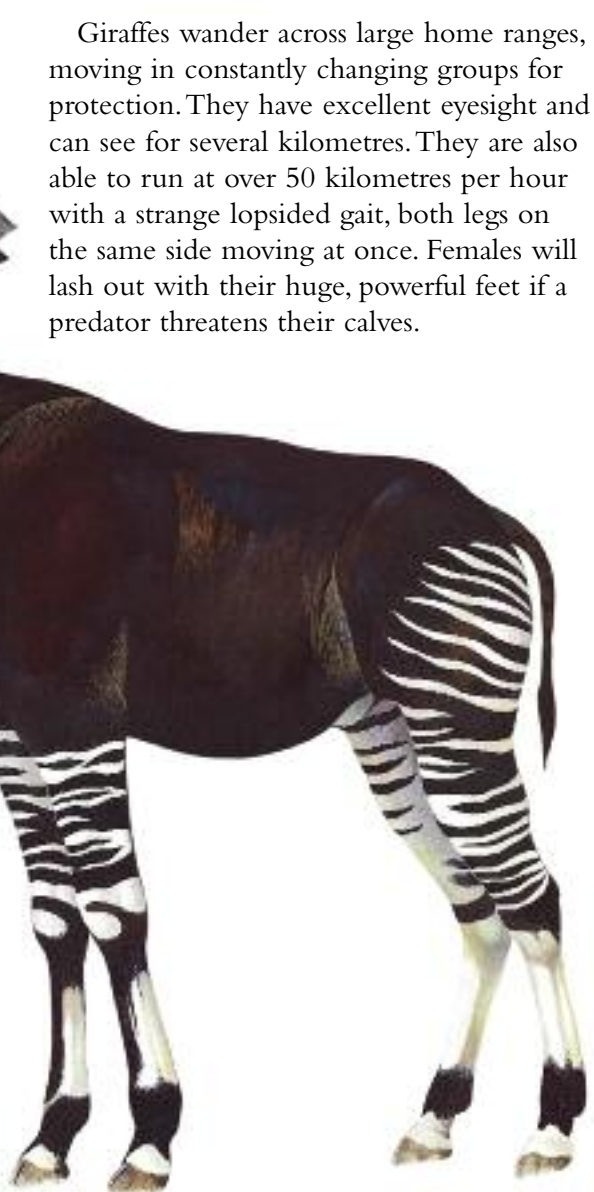


Giraffes wander across large home ranges, moving in constantly changing groups for protection. They have excellent eyesight and can see for several kilometres. They are also able to run at over 50 kilometres per hour with a strange lopsided gait, both legs on the same side moving at once. Females will lash out with their huge, powerful feet if a predator threatens their calves.

Okapis are related to the giraffes, although with their black-and-white striped legs they also resemble zebras. Like giraffes, they have small, skin-covered horns and an extremely long tongue, that they can even use to clean their eyelids. Okapis live in the African rainforest and are secretive creatures, feeding on young shoots and leaves. Unlike giraffes, their sense of sight is not good and they rely on smell and hearing.

This efficient process of digestion means that the ruminants are able to spend less time eating than do other ungulates, such as horses. They also do not need to drink as often, so they can roam more freely in harsh conditions such as deserts.

Giraffes live in open wooded areas of the African grasslands. With adult males measuring over five metres in height, they are the tallest animals on land. They have long legs, sloping backs and extremely long necks, which means that they can feed on leaves and shoots from trees that other animals cannot reach.



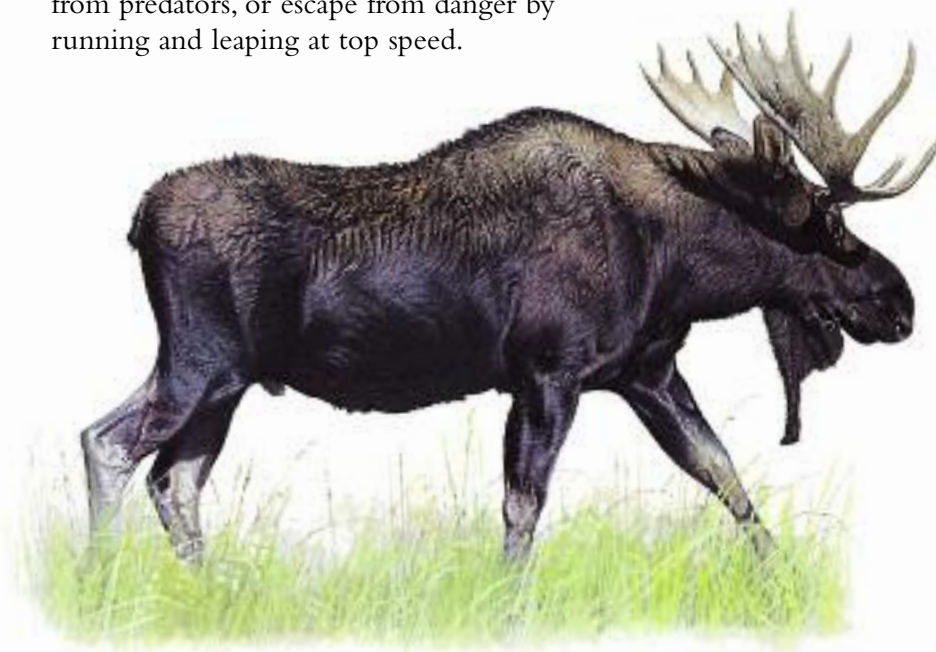
Wild cattle, sheep, goats, antelopes and gazelles are known as **bovids**. The first three groups of bovids have been domesticated by humans for thousands of years, but they still have many wild relatives. Small bovids, such as gazelles, feed on higher-quality plant material such as fruits, leaves and bark. The large cattle are grazers, breaking down their poorer diet of grass by chewing the cud (partially digested food).

Many bovids live in herds, which in the African buffalo can number hundreds of individuals. Cattle and antelopes are preyed upon by big cats or wild dogs. The predators usually target young or sick cattle, but adult cattle are sometimes able to drive them away by forming a defensive group or attacking with their horns. Antelopes of all ages are vulnerable to attack. They hide from predators, or escape from danger by running and leaping at top speed.



African buffaloes are aggressive towards enemies: lions, crocodiles and humans.

Deer look very similar to antelopes, but, unlike antelopes, deer do not have a permanent set of bony horns. A deer's antlers (possessed only by males except in the reindeer) are shed and regrown every year, as they are often damaged in fights.



The moose or elk (left) is the largest member of the deer family. It stands over 2 metres high, and has massive antlers.

Long-legged gazelles (below) are built for speed. As they run from predators, they will suddenly leap stiff-legged into the air. This is known as pronking.

Sheep and goats live in rocky, mountain environments. Some are solitary and will fight fiercely for territory, while others group together in herds. They have stocky but agile bodies, and are able to run and leap over dangerous terrain without falling. Males and females both usually have horns, though those of the male are larger. During fights the males clash their horns with great force. Goats also stab violently while sheep bang their heads together.



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