

LESSON 8

CARNIVORES

Aim

Describe the distinguishing characteristics of animals within the order Carnivora.

CLASSIFICATION OF CARNIVORES

The grandorder Ferae includes one single order: Carnivora; the Carnivores. This group includes dogs, wolves, bears, racoons, cats, weasels, hyenas, seals, sea lions and walruses. Animals belonging to the order Carnivora are readily identified by their prominent canine teeth. These are long, curved teeth, located beside the incisors. Most have short, sharp incisors that are good for nipping at prey; but some e.g. large cats have large incisors that can kill with one bite. Most are predators that hunt and eat meat.

Carnivores have strong jaws and powerful muscles in the head and neck and a heavy skull. These characteristics enable them to use the incisor teeth more effectively.

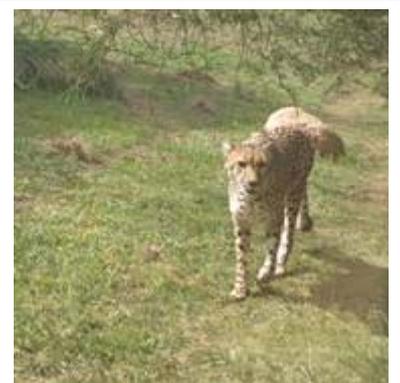
Carnivores are Fissiped or Pinniped, characteristics that refer to their feet. Most carnivores have toes that are separated. These animals are known as Fissipeds, and they include cats and wolves. There are some species, those that are aquatic, that have toes that are joined, a feature that helps with swimming. These "fin footed" types are called Pinnipeds. Seals and sea lions are examples of pinnipeds.

Order Carnivora

The order Carnivora is made up of about 250-300 species of mammals in 8 -12 families. The main distinction between other mammals and carnivores is their eating habits: carnivores are strictly meat-eaters. Although insectivores also feed on meat, they are classed separately because of their appearance, and no carnivores eat only insects. Many carnivores do feed on plants, but this is not their staple diet.

Carnivores are typically large in size, from the size of a house cat to a Kodiak bear. They all have furry or hairy coats that usually thicken in the winter. Many are nocturnal. The teeth are well developed and include molars and sharp canines ideal for the shredding of meat. The sense of smell is very acute, as is the sense of sight in most species. Pack hunting is mostly consistent with the canines, felines, and hyenas. All carnivores have strong claws and chest muscles and prominent canines. The 12 families of carnivore are:

- Canidae (dogs, jackals, fox, wolves)
- Ursidae (bears, panda)
- Procyonidae (raccoons, lesser panda)
- Mustelidae (otters, weasels, badgers)
- Mephitidae (skunks-previously part of Mustelidae)
- Viverridae (civets, genets)
- Herpestidae (mongooses-often considered part of Viverridae)
- Hyaenidae (hyenas, aardwolf)
- Felidae (cats, lion, tiger)
- Odobenidae (walrus)
- Phocidae (true, earless, or hair seals)
- Otariidae (eared seals, sea lions)



The Cheetah, *Acinonyx jubatus* (Fam. Felidae), the fastest carnivore on Earth on short runs, up to 70 mph. Their spine is long and extremely supple, adapted to the sinusoidal movement needed to run fast.

Carnivores are naturally distributed throughout the world, except for Australia, New Guinea, New Zealand, Antarctica, and many oceanic islands. One species, *Canis familiaris*, apparently was introduced into Australia by human agency in prehistoric time and subsequently established wild populations on that continent.

Two living superfamilies of carnivores are usually recognized:

- the Arctoidea (or Canoidea), with the families Canidae, Ursidae, Procyonidae, and Mustelidae; and the
- Aeluroidea (or Feloidea), with the families Viverridae, Hyaenidae, and Felidae. The Pinnipedia with families Odobenidae, Phocidae, and Otariidae are often regarded as a full separate order.

The smallest living carnivore is the least weasel (*Mustela nivalis*), which has a weight of 35-70 grams. The largest is the Kodiak subspecies of grizzly bear reaching a weight of 780 kg.

Most carnivores are terrestrial or climbing animals. The polar bear (*Ursus maritimus*) and the river otters (*Lutra*, *Aonyx*, *Pteronura*) are semi aquatic, and the sea otter (*Enhydra*), seals, and walrus spend more time in water than onshore.

Family Canidae (dogs, wolves, foxes)

This family of 16 genera and 36 medium-sized species has a natural distribution that includes all land areas of the world except the most oceanic islands and Antarctica. Dingo, the only wild representative in Australia and New Guinea, is commonly regarded as a subspecies of domestic dog.

Canids have slender muscular body, strong moderately elongated legs, long bushy tail, long muzzle with strong jaws, large ears. Five toes on forefeet (with one exception) and four on hindfeet. Claws are not retractile. Good runners. They have acute senses of smell and hearing.

Smaller species such as foxes and jackals feed on insects, small rodents and birds, and live in pairs or alone. Bigger species (wolves, wild dogs) live in packs with strict social hierarchies and hunt large prey (undulates and other herbivores).

Canids catch prey by pursuit over long distances in relatively open terrain until the prey tires. Kills are made by grabbing for the nape of neck and tackling the prey to the ground. Some species like wolves and jackals are exterminated as pests for attacking domestic animals. Other species have been targeted as carriers of rabies. Some foxes are valued for their pelts.

The domestic dog has been domesticated since prehistoric times. Dogs have been used by humans for transport, hunting, guarding of livestock, and as pets.

Family Ursidae (bears)

Three recent genera with eight species naturally distributed in Eurasia, North America, in North Africa and in the Andes of South America. Fossils are known from late Miocene. Closely related to dogs (family Canidae) and raccoons (Procyonidae), the Great Panda *Ailuropoda melanoleuca* used to be included into Procyonidae family, but more recent research places it with bears.

Bears have a big head, a large heavily built body, short and powerful limbs, a short tail, small eyes, moderately elongated muzzle. The ears are small, rounded, and erect. All limbs have five digits. Strong non-retractile claws are used for tearing and digging.

Bears have plantigrade feet: they walk with the heel of the foot touching the ground. They are capable of walking on their hind legs for some distances.



The brown bear – *Ursus arctos* (Fam. Ursidae) is a native to Asia, the Atlas mountains of Africa (Morocco), Europe and North America. It is a vulnerable or threatened species all over the world where there are still populations remaining

Their eyesight and hearing are not that good as most of carnivores, but sense of smell is excellent.

The fur is long and shaggy, usually brown, black, or white (Polar Bear). Some dark-coloured species have patches of lighter colours on a chest or face. The Panda *Ailuropoda melanoleuca* has a well known striking black and white colour pattern, as its name implies (melanos-black, coloured -leuca white).

Size from 100 cm and 27-46 kilograms (59-80 pounds) – the Sun bear *Helarctos malayanus* - to almost 3m and 780 kg. - the largest living carnivore, the Kodiak bear *Ursus arctos middendorffi*. Males average about 20 percent larger than females.

Bears are omnivorous and include berries, pine cones, fruits, roots, leafs and grass in their diet, except the polar bear (*Ursus maritimus*) that feeds almost exclusively on fish and seals (the only available food in polar bear habitat). Panda is almost completely vegetarian sustaining mainly on young leafs and steams of bamboo.



Habitats range from arctic ice to tropical forests. Polar bears are semi aquatic animals known to swim for hundreds of kilometres in freezing Arctic Ocean waters.

Most bears shelter in caves, hollow logs, dense vegetation, or dig dens in hillsides. During the autumn bears become fat and as the weather gets colder, they stop eating and go to sleep (hibernate) in a den till spring. Polar bears are usually active all year round, except pregnant females.

The lifespan of bears in the wild is 15 to 30 years, longer in captivity.

Bears live alone, except pairs in the mating season and females with cubs. Births occur while the mother is hibernating.

Although bears are very large, strong and dangerous animals, despite their reputation, they avoid conflicts if possible and usually don't attack humans unless provoked.

Family Procyonidae (raccoons and allais)

This family contains 6-7 recent genera and 18-19 species including raccoons, coatis or coatimundis, olingos, the ring-tailed cat, kinkajou, and lesser panda. Procyonides are restricted to New World (moderate, subtropical, and tropical regions of both Americas) with the exception of Lesser Panda found in South-east Asia.

Raccoons are successfully introduced to Euroasia (Germany and many regions in Former Soviet Union). Fossils are known from the late Eocene. Together with dogs and bears, this family Procyonidae is a member of the Canoid superfamily of carnivores.

They are of medium body size of between 30-70 cm and weight from 1 to 12 kg. Like bears, males are about twenty percent larger than females. The fur colour is usually grey or brown with facial markings and the tail is usually ringed with whitish bands. The face is short and broad. The ears are short, furred, erect, rounded or pointed. Each limb bears five digits; claws are short and none retractile or semi retractile. Senses are not particularly acute, but Raccoons are recognized for their intellect and curiosity.

Like bears, procyonidae are omnivorous, eating insects, crayfish and crabs, fishes, amphibians, reptiles, birds and eggs, small mammals, fruits, berries, nuts, roots, and young plants. Some species are solitary, other live in family groups or bands (Coatis *Nasua* species, Olingos *Bassaricyon* species). Most species are nocturnal, arboreal or semi arboreal.

Family Mustelidae (weasels, badgers, skunks, otters)

The largest family of all: Carnivora. Includes about 20 recent genera with about 55 species naturally distributed in all continents except Australia, Antarctica, and most oceanic islands including New Zealand and New Guinea. Skunks (family Mephitidae) are often considered members of this family. Mustelids belong to the Canoid superfamily. Fossils are known from the Early Oligocene. They are small or medium-sized carnivores. The smallest member of this family is the least weasel *Mustela nivalis* (about 120-250 mm and 30 to 70 grams (or one to 2.5 ounces)). The largest species of Mustelids are the sea otter *Enhydra lutris* (more than 1 meter and a weight of up to 41 kg or 90 pounds). Like in other Canoids, male Mustelids are usually larger than females (about 25% difference). The fur can be uniformly brown or grey, spotted, or striped. They have an excellent sense of smell, good eyesight and hearing.

The body is usually elongated and slender with the exception of wolverine (*Gulo gulo*) and in badgers (*Taxidea taxus* in North America, *Meles meles* in Eurasia). The ears are short, rounded or pointed. The short limbs have five digits each. Walk on their digits, or partly on their digits and partly on their soles. As in other canoids, the claws are non-retractile. Badgers have large strong claws used for burrowing. Otters have webbed paws for swimming. Most have anal scent glands.

Some species are nocturnal, others are diurnal. They shelter in crevices, burrows, and trees. Badgers build elaborate burrows with many chambers of different use. Arboreal and semi arboreal species are good climbers: semi aquatic species (otters, minks) are excellent swimmers.

Mustelids are mainly predators, only occasionally including plant material in their diet, with a few omnivorous exceptions (Eurasian Badger, Ferret Badgers *Melogale* species, and Honey badgers *Mellivora capensis*). Lifespan in the wild varies from 5 to about 20 years in different species.

Some species can kill poultry and are considered pests by farmers. Some species are hunted for fur (Eurasian Sable *Martes zibellina*, American Sable *M. Americana*).

Family Mephitidae (skunks)

There are 10 living species in three genera which are similar to Mustelids and often included into that family. They are distributed throughout the New World with the exception of Polar Regions. There were unsuccessful attempts to introduce Striped Skunks to South-eastern region of Russia as fur hunting animals.

They are medium-sized animals from about 40 to almost 70 centimetres, and from about half a kilogram (the Pygmy Spotted Skunk, *Spilogale pygmaea*) up to as much as 6 kilograms (North American, or Striped, Skunk *Mephitis mephitis*). They have moderately elongated bodies with relatively short, strong legs. Five digits on all paws, claws are non-retractile. Long front claws used for digging. Fur is usually coloured black-and-white, striped or spotted, some species are brown, grey, or cream-coloured.

All skunks are nocturnal. Feed on insects, worms, amphibians, reptiles, bird eggs. Usually solitary, territorial animals, but not aggressive to its own species and occasionally gather in groups and shelter in burrows.

Skunks use the secretions of their anal glands as a defensive measure. This secretion is a highly offensive mixture of methane and butane compounds flavoured with sulphur. The contrasting pattern of body colours is thought to be a form of warning colouration associated with the fetid anal gland secretion. Body movement is also used for warning.

Striped skunks with surgically removed scent glands are sometimes kept as pets in the USA.

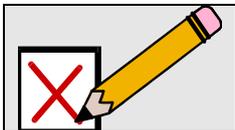
Family Viverridae (civets, genets, linsangs)

This family is native to southern Europe, Africa and Asia, including Indonesia and the Philippines. The family includes 34 species currently placed in 20 genera. These numbers rise to 36 living genera and 75 species if mongooses are included in this family as modern researches tend to. That would make Viverrids the largest family of all carnivores.

Viverrids are medium-sized carnivores with long bodies and relatively short legs. Their bodies range from around 300 mm in length to 1000 mm in length. Weights range from slightly less than 1 kg to 14 kg. Most species have relatively small heads with short, pointed or semi-pointed, erect ears and a relatively long, pointed muzzle. Their eyes are of medium size.

Most species have stripes, spots, or bands on their bodies. Tails are often ringed with contrasting colours. Their claws can be retracted. Most have perianal glands that produce a strong-smelling substance; in some species the odour is sufficiently potent to ward off predators. The secretion of these glands, called civet, is used as a perfume base and medicine. Male Viverrids have a baculum .

Most Viverrids are nocturnal hunters, feeding on small lizards, snakes, rodents, birds, insects and other invertebrates. Some species also include berries, fruit and roots in their diets. Viverrids generally do not associate in large groups, but rather pairs or small family groups. Most species are arboreal. Their senses of sight, smell, and hearing are acute.

	SELF ASSESSMENT Perform the self assessment test titled 'test 8.1' If you answer incorrectly, review the notes and try the test again.
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Family Herpestidae (mongooses)

Often included into the family Viverridae. There are about 20 recent genera with 34 species mostly from Africa, with one genus distributed also in Asia and southern Europe. One subfamily with 4 or 5 genera are restricted to Madagascar.

Mongooses are small carnivores. Their body lengths vary from around 23 cm to over 75 cm, and their weights range from less than 1 kg to around 5 or 6 kg. Most are brown or grey, a few species are striped. A very few species have banded tails. The claws are non-retractile. Herpestids tend to have small heads, pointed snouts, and short, rounded ears. Many have anal glands that secrete a foul-smelling substance.

Most Herpestids are predators, feeding on a wide range of animals including small mammals, birds, bird eggs, lizards and snakes, insects, and crabs. Their ability to kill poisonous snakes such as cobras and adders is legendary. Their success is due to speed and agility, for they are not immune to the snake's poison. Some species also include fruits and berries in their diet.

Some Herpestids are gregarious, occurring in colonies, others are solitary. Most species are terrestrial, building complex burrow systems. Others are arboreal or semiaquatic.

Mongooses have been introduced to a number of places, usually to help control snakes and rodent pests. As often happens with such enterprises, mongooses became pests in many regions they were introduced to, creating more problems than they solved.

Family Hyaenidae (hyenas and aardwolf)

This family of three recent genera with four species is naturally distributed in Africa and south-western Asia and India. Fossils are known from the Miocene.

Although Hyaenidas look somewhat similar to dogs, they are closely related to cats and Viverrids. Medium to large size animals. Head and body length is 55-165 cm, and weight is 9-86 kg. The fur is striped in *Proteles* and *Hyaena hyaena*, spotted in *Crocuta*, and unmarked in *Hyaena brunnea*. *Proteles* and *Hyaena* have a well developed mane. The fur is coarse and the tail is bushy. Jaws are strong and massive and used to crush bones (Aardwolf, as an insect eater, is an exception). Ears are rounded.

The head and forequarters are large; forelimbs are long, but the hindquarters are weaker and hind legs are shorter, giving the animals a rather strange look of always running uphill.

Proteles has five digits on the forefoot and four on the hind foot, others have four digits on each foot. Claws are non-retractile. Hyaenids have anal scent glands.

Habitats include open lands from grasslands and bush land to open forest. They shelter in caves, dense vegetation, or the abandoned burrows of other animals. Hyaenids are nocturnal. The Aardwolf feeds primarily on insects; other species are predators of large mammals and scavengers. Hunt in packs; groups have a complex social structure with dominating females.

Family Felidae (cats)

This family of 4 recent genera (arguably 1 to 8) with 38 species has a natural distribution that includes all continents except Antarctica and Australia. In Australia domestic cats were introduced by European settlers. Both domestic and feral cats there are devastating unique local fauna of lizards, small marsupials, rodents, and birds. Fossils of cats are known from Late Eocene. (43.6 to 36.6 million years ago)

Cats are generally solitary highly specialized nocturnal hunters, with a few exceptions like social lions hunting at daylight Cats have a short muzzle, round face, large eyes, pointed ears, powerful muscular body, soft fur, often strikingly patterned, and have acute sense of smell and hearing.

Cats are divided into two groups - "big" cats (seven species - Tiger, Lion, Cheetah, Jaguar, Leopard, Snow Leopard, and Clouded Leopard) and "small" cats (all of the remainder, not always really small in size).

Big cats range in size from the Clouded Leopard *Neofelis nebulosa* at 106cm (42 inches) and a weight of about 23kg (50 pounds) and Tiger *Panthera tigris* (length of about 2.2m; and a maximum weight of about 230-290kg (500-630 pounds).

All small cats are traditionally regarded members of one genus, *Felis*. The biggest of them, Puma, is bigger than some big cats (up to 2m or 6.5 ft, and 105kg or 230 lb). The smallest wild species is the Sand Cat of about 3 kg, or 7 lb, populating arid areas in Northern Africa and South-West Asia.

Usually cats hunt using ambushes with an occasional short chase, some species at a very high speed (Cheetah, Serval). Smaller species include lots of insects, small lizards, birds, fish and other small animals in their diet. Many species target wetland habitats.

The hunting method of Felids consists of a preliminary stalking, followed by a final quick rush. Cats aim for the neck and usually sever the cervical vertebrae with their sharp, pointed canines. They rely on their sense of sight; their eyes are relatively large compared to other carnivores. They also have well-developed senses of smell and hearing, and at close range, their long whiskers provide an acute sense of touch.

Felids are usually solitary. An exception is the African lion, which forms prides usually of several related females and a male. Females of a pride hunt in packs.

Domestic cat was domesticated by ancient Egyptians about five thousand years ago (probably the very first animal fully domesticated) and now is the smallest species of all Felids.

The next three families are combined into suborder Pinnipedia, which is often regarded as a full order. Aquatic animals occurring along coastlines and arctic and Antarctic ice fronts. Return to coast or ice for breeding seasons. Most have torpedo-shaped body with short neck, five digits limbs are turned into flippers.

Family Otariidae (eared seals, fur seals, and sea lions)

There are seven recent genera with 14 living species. They are naturally distributed along the coasts of north-eastern Asia, western North America, South America, southern Africa, southern Australia, New Zealand, and numerous oceanic islands. Only marine animals.

Total length in Otariids is 120-350 cm and weight is about 27-1,100kg, males always much larger than females. Unlike other Pinnipeds, Otariidae have external ear flaps, although small and cartilaginous. Like walrus, Otariidae can turn the hind flippers forward and use them for walking or running on land. Members of this family swim mostly using forelimbs. Sea lions have a coat of short, coarse fur. Fur seals have very thick underfur and are hunted as fur animals.

Highly social and gregarious. During the breeding season they form herds of hundreds or thousands animals.



New Zealand Fur Seal *Arctocephalus fosteri* (Fam. Otariidae, Subfam. Arctocephalinae), a protected species found in the south coast of Australia and the South Island of New Zealand.

They are polygamous. Eared seals feed on fish, cephalopods, and crustaceans.

Family Odobenidae (walrus)

This family is made up by a single living species, *Odobenus rosmarus*. Walruses are distributed in Arctic Ocean and northern parts of Pacific Ocean. Males are very large, up to 3.6m or 12 feet, weight of up to 2 tonnes. Females are smaller, less than half of males' weight. Body is bulky and heavy. Like true seals, they lack external ears. Like eared seals, they can turn hind flippers forward and use them for walking and running while on land. They have large paddle-like forelimbs that reach about 25% of length of the body. The skin is wrinkled, very thick, with underlying blubber of up to 15 cm in thickness. Hairs are scattered.

The upper canines grow into large tusks. They grow continuously and in some males may exceed 100cm in length or 60cm in females. These tusks are used for digging food out of the sea-bed, and males use them for fights, when defending their harems and breeding ground from other males. Highly gregarious, herds of hundreds or thousands walruses are often reported. They are polygamous. The eyesight is excellent; vibrissae on their snout provide tactile information, while other senses are not so good.

Family Phocidae (true seals)

This family contains 10 recent genera with about 19 species. Seals are distributed along coastlines in areas with temperate climate (roughly north of 30 degrees N latitude and south of 50 degree S latitude) with a few species also found at subtropical localities (Mediterranean Monk Seal *Monachus monachus*), and some species found in freshwater lakes and rivers. The Baikal Seal (*Phoca siberica*) is the only fully freshwater species.

Seals vary in size. The smallest species are Baikal Seal with 35 Kg and the Ringed Seal with a weight of around 90 kg; the largest one is the Elephant Seal *Mirounga leonine*, that weight up to 3600 or even 5000 kg. As with most fast swimmers, bodies are streamlined. External ears are absent. Forelimbs are relatively short, less than 25% of the length of the body.

Claws are well developed. The large hind flippers can not be turned forward and are not used for movement. Seals are unable to walk or run on land. Instead, they are flexing and sliding on their belly, but move pretty quickly.

Adults usually have stiff and short fur; some species have almost naked skin. Some have spotted or banded colour patterns. Young of many Phocids are covered with dense and soft fur and are hunted by man. A thick layer of blubber beneath the skin keeps them warm in freezing conditions. The weight of the blubber may be around 25% of the entire weight of the animal in some species.

Seals mostly feed on fish and molluscs (squid, octopus, and shellfish). Ironically named, the Crabeater Seal *Lobodon carcinophagus* mainly feeds on krill, being the only plankton eating member of the entire order. The largest of Antarctic species, Leopard Seal *Hydrurga leptonyx* feeds on penguins and smaller seals. Most species are monogamous or associate in small groups. Elephant seals are gregarious and polygamous. Some species are migratory. All seals are expert divers, although their abilities vary from species to species. Weddell seal *Leptonychotes weddelli* is recorded to reach depths of 600m and to stay submerged for 43 minutes and 20 seconds.

TERMINOLOGY

- Mustelid - This is a type of animal that has short legs, a long body and scent glands. Examples include skunks, weasels and badgers.



SELF ASSESSMENT

Perform the self assessment test titled 'test 8.2'

If you answer incorrectly, review the notes and try the test again.

SET TASK

Observe a dog closely. Take note of its external features in the light of the things you have learned in this lesson. Notice the shape of the head, body and legs, the characteristics of the feet, etc. Make notes on your observations. Compile a scientific description of the anatomy of the dog you observed. Where possible, use technical terminology that you have learned during your course.



ASSIGNMENT

Download and do the assignment called 'Lesson 8 assignment'.