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1.1 Natural selection

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1.2 Cat

This article is about the cat species that is commonly kept as a pet. For the cat family, see Felidae. For other uses, see Cat (disambiguation) and Cats (disambiguation).

The domestic cat[1][2] (Felis catus[2] or Felis silvestris catus[4]) is a small, usually furry, domesticated, and carnivorous mammal. They are often called a housecat when kept as an indoor pet,[6] or simply a cat when there is no need to distinguish them from other felids and felines. Cats are often valued by humans for companionship, and their ability to hunt vermin and household pests.

Cats are similar in anatomy to the other felids, with strong, flexible bodies, quick reflexes, sharp retractable claws, and teeth adapted to killing small prey. Cat senses fit a crepuscular (active during the early morning and evening) and predatory ecological niche. Cats can hear sounds too faint or too high in frequency for human ears, such as those made by mice and other small animals. They can see in near darkness. Like most other mammals, cats have poorer color vision and a better sense of smell than humans.[citation needed]

Despite being solitary hunters, cats are a social species, and cat communication includes the use of a variety of vocalizations (mewing, purring, trilling, hissing, growling, and grunting), as well as cat pheromones, and types of cat-specific body language[7]

Cats have a high breeding rate. Under controlled breeding, they can be bred and shown as registered pedigree pets, a hobby known as cat fancy. Failure to control the breeding of pet cats by neutering, and the abandonment of former household pets, has resulted in large numbers of feral cats worldwide, requiring population control[8]

Since cats were cult animals in ancient Egypt, they were commonly believed to have been domesticated there,[9] but there may have been instances of domestication as early as the Neolithic from around 9500 years ago (7500 BC).[10] A genetic study in 2007 concluded that domestic cats are descended from African wildcats (Felis silvestris lybica), having diverged around 8000 BC in West Asia.[9][11] Cats are the most popular pet in the world, and are now found in almost every place where humans live[12]

1.2.1 Nomenclature and etymology

The English word 'cat' (Old English catt) is in origin a loanword, introduced to many languages of Europe from Latin cattus[13] and Byzantine Greek κάττα, including Portuguese and Spanish gato,
French *chat*, German *Katze*, Lithuanian *katė* and Old Church Slavonic *kotka*, among others.[14] The ultimate source of the word is Afroasiatic, presumably from Late Egyptian *čaute*,[15] the feminine of *čaus* "wildcat". The word was introduced, together with the domestic animal itself, to the Roman Republic by the first century BC.[citation needed] An alternative word with cognates in many languages is English 'puss' ('pussycat'). Attested only from the 16th century, it may have been introduced from Dutch *poes* or from Low German *puuskatte*, related to Swedish *kattepus*, or Norwegian *pus, pusekatt*. Similar forms exist in Lithuanian *puižė* and Irish *puiscín*. The etymology of this word is unknown, but it may have simply arisen from a sound used to attract a cat.

A group of cats is referred to as a "clowder" or a "glaring",[18] a male cat is called a "tom" or "tomcat"[19] (or a "gib",[20] if neutered), an unaltered female is called a "queen"[21] and a prepubescent juvenile is referred to as a "kitten". Although spayed females have no commonly used name, in some rare instances, an immature or spayed female is referred to as a "molly".[citation needed] The male progenitor of a cat, especially a pedigreed cat, is its "sire",[22] and its female progenitor is its "dam".[23] In Early Modern English the word 'kitten' was interchangeable with the now-obsolete word 'catling'.[24]

A pedigreed cat is one whose ancestry is recorded by a cat fancier organization. A purebred cat is one whose ancestry contains only individuals of the same breed. Many pedigreed and especially purebred cats are exhibited as show cats. Cats of unrecorded, mixed ancestry are referred to as domestic short-haired or domestic long-haired cats, by coat type, or commonly as random-bred, moggies (chiefly British), or (using terms borrowed from dog breeding) mongrels or mutt-cats.

While the African wildcat is the ancestral subspecies from which domestic cats are descended, and wildcats and domestic cats can completely interbreed, several intermediate stages occur between domestic pet and pedigree cats on one hand and those entirely wild animals on the other. The semiferal cat, a mostly outdoor cat, is not owned by any one individual, but is generally friendly to people and may be fed by several households. Feral cats are associated with human habitation areas and may be fed by people or forage in rubbish, but are typically wary of human interaction.[25]

### 1.2.2 Taxonomy and evolution

*Main article: Cat evolution*

The African wildcat, *Felis silvestris lybica*, is the ancestor of the domestic cat.

The felids are a rapidly evolving family of mammals that share a common ancestor only 10–15 million years ago[26] and include lions, tigers, cougars and many others. Within this family, domestic cats (*Felis catus*) are part of the genus *Felis*, which is a group of small cats containing about seven species (depending upon classification scheme).[1][27] Members of the genus are found worldwide and include the jungle cat (*Felis chaus*) of southeast Asia, European wildcat (*F. silvestris silvestris*), African wildcat (*F. s. lybica*), the Chinese mountain cat (*F. bieti*), and the Arabian sand cat (*F. margarita*), among others.[28]

The domestic cat was first classified as *Felis catus* by Carolus Linnaeus in the 10th edition of his *Systema Naturae* in 1758.[1] [3] Because of modern phylogenetics, domestic cats are usually regarded as another subspecies of the wildcat, *F. silvestris*. [1] [4][29] This has resulted in mixed usage of the terms, as the domestic cat can be called by its subspecies name, *Felis silvestris catus*. [1][4][29] Wildcats have also been referred to as various subspecies of *F. catus*,[29] but in 2003, the International Commission on Zoological Nomenclature fixed the name for wildcats as *F. silvestris*. [30] The most common name in use for the domestic cat remains *F. catus*, following a convention for domesticated animals of using the earliest (the senior) synonym proposed.[30] Sometimes, the domestic cat has been called *Felis domesticus* [31] or *Felis domestica*,[1] as proposed by
German naturalist J. C. P. Erxleben in 1777 but these are not valid taxonomic names and have been used only rarely in scientific literature. A population of Transcaucasian black feral cats was once classified as *Felis daemon* (Satunin 1904) but now this population is considered to be a part of domestic cats.

All the cats in this genus share a common ancestor that probably lived around 6–7 million years ago in Asia. The exact relationships within the Felidae are close but still uncertain. The Chinese mountain cat is sometimes classified (under the name *Felis silvestris bieti*) as a subspecies of the wildcat, like the North African variety *F. s. lybica*. In comparison to dogs cats have not undergone major changes during the domestication process, as the form and behavior of the domestic cat is not radically different from those of wildcats and domestic cats are perfectly capable of surviving in the wild. Fully domesticated house cats often interbreed with feral *F. catus* populations. This limited evolution during domestication, means that hybridisation can occur with many other felids notably the Asian leopard cat. Several natural behaviors and characteristics of wildcats may have preadapted them for domestication as pets. These traits include their small size, social nature, obvious body language, love of play and relatively high intelligence, they may also have an inborn tendency towards tameness.

Cats have either a mutualistic or commensal relationship with humans. Two main theories are given about how cats were domesticated. In one, people deliberately tamed cats in a process of artificial selection, as they were useful predators of vermin. This has been criticized as implausible, because the reward for such an effort may have been too little; cats generally do not carry out commands and although they do eat rodents, other species such as ferrets or terriers may be better at controlling these pests. The alternative idea is that cats were simply tolerated by people and gradually diverged from their wild relatives through natural selection, as they adapted to hunting the vermin found around humans in towns and villages.

### 1.2.3 Genetics

**Main article: Cat genetics**

The domesticated cat and its closest wild ancestor are both diploid organisms that possess 38 chromosomes and roughly 20,000 genes. About 250 heritable genetic disorders have been identified in cats, many similar to human inborn errors. The high level of similarity among the metabolism of mammals allows many of these feline diseases to be diagnosed using genetic tests that were originally developed for use in humans, as well as the use of cats as animal models in the study of the human diseases.

### 1.2.4 Anatomy

**Main article: Cat anatomy**

Domestic cats are similar in size to the other members of the genus *Felis*, typically weighing between 4 and 5 kg (8.8 and 11.0 lb). However, somebreeds, such as the Maine Coon, can occasionally exceed 11 kg (25 lb). Conversely, very small cats (less than 1.8 kg (4.0 lb)) have been reported. The world record for the largest cat is 21.3 kg (47 lb). The smallest adult cat ever officially recorded weighed around 1.36 kg (3.0 lb). Feral cats tend to be lighter as they have more limited access to food than house cats. In the Boston area, the average feral adult male will weigh 3.9 kg (8.6 lb) and average feral female 3.3 kg (7.3 lb). Cats average about 23–25 cm (9–10 in) in height and 46 cm (18.1 in) in head/body length (males being larger than females), with tails averaging 30 cm (11.8 in) in length.
Cats have seven cervical vertebrae, as do almost all mammals; 13 thoracic vertebrae (humans have 12); seven lumbar vertebrae (humans have five); three sacral vertebrae like most mammals (humans have five); and a variable number of caudal vertebrae in the tail (humans retain three to five caudal vertebrae, fused into an internal coccyx). The extra lumbar and thoracic vertebrae account for the cat's spinal mobility and flexibility. Attached to the spine are 13 ribs, the shoulder, and the pelvis. Unlike human arms, cat forelimbs are attached to the shoulder by free-floating clavicle bones which allow them to pass their bodies through any space into which they can fit their head.

The cat skull is unusual among mammals in having very large eye sockets and a powerful and specialized jaw. Within the jaw, cats have teeth adapted for killing prey and tearing meat. When it overpowers its prey, a cat delivers a lethal neck bite with its two long canine teeth, inserting them between two of the prey's vertebrae and severing its spinal cord, causing irreversible paralysis and death. Compared to other felines, domestic cats have narrowly spaced canine teeth, which is an adaptation to their preferred prey of small rodents, which have small vertebrae. The premolar and first molar together compose the carnassial pair on each side of the mouth, which efficiently shears meat into small pieces, like a pair of scissors. These are vital in feeding, since cats' small molars cannot chew food effectively.

Cats, like dogs, are digitigrades. They walk directly on their toes, with the bones of their feet making up the lower part of the visible leg. Cats are capable of walking very precisely, because like all felines, they directly register; that is, they place each hind paw (almost) directly in the print of the corresponding fore paw, minimizing noise and visible tracks. This also provides sure footing for their hind paws when they navigate rough terrain. Unlike most mammals, when cats walk, they use a "pacing" gait; that is, they move the two legs on one side of the body before the legs on the other side. This trait is shared with camels and giraffes. As a walk speeds up into a trot, a cat's gait changes to be a "diagonal" gait, similar to that of most other mammals (and many other land animals, such as lizards): the diagonally opposite hind and fore legs move simultaneously.

Like almost all members of the Felidae, cats have protractable and retractable claws. In their normal, relaxed position, the claws are sheathed with the skin and fur around the paw's toe pads. This keeps the claws sharp by preventing wear from contact with the ground and allows the silent stalking of prey. The claws on the fore feet are typically sharper than those on the hind feet. Cats can voluntarily extend their claws on one or more paws. They may extend their claws in hunting or self-defense, climbing, kneading, or for extra traction on soft surfaces. Most cats have five claws on their front paws, and four on their rear paws. The fifth front claw (the dewclaw) is proximal to the other claws. More proximally is a protrusion which appears to be a sixth "finger". This special feature of the front paws, on the inside of the wrists, is the carpal pad, also found on the paws of big cats and of dogs. It has no function in normal walking, but is thought to be an antiskidding device used while jumping. Some breeds of cats are prone to polydactyly (extra toes and claws). These are particularly common along the northeast coast of North America.

### 1.2.5 Physiology

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Cats are familiar and easily kept animals, and their physiology has been particularly well studied; it generally resembles that of other carnivorous mammals, but displays several unusual features probably attributable to cats' descent from desert-dwelling species. For instance, cats are able to tolerate quite high temperatures: Humans generally start to feel uncomfortable when their skin temperature passes about $38 \, ^\circ C (100 \, ^\circ F)$, but cats show no discomfort until their skin reaches around $52 \, ^\circ C (126 \, ^\circ F)$, and can tolerate temperatures of up to $56 \, ^\circ C (133 \, ^\circ F)$ if they have access to water.[63]

Cats conserve heat by reducing the flow of blood to their skin and lose heat by evaporation through their mouths. Cats have minimal ability to sweat, with glands located primarily in their paw pads,[64] and pant for heat relief only at very high temperatures[65] (but may also pant when stressed). A cat's body temperature does not vary throughout the day; this is part of cats' general lack of circadian rhythms and may reflect their tendency to be active both during the day and at night.[66]

Cats' feces are comparatively dry and their urine is highly concentrated, both of which are adaptations to allow cats to retain as much water as possible.[31] Their kidneys are so efficient, they can survive on a diet consisting only of meat, with no additional water[67] and can even rehydrate by drinking seawater.[66][68]

Cats are obligate carnivores, their physiology has evolved to efficiently process meat, and they have difficulty digesting plant matter.[31] In contrast to omnivores such as rats, which only require about 4% protein in their diet, about 20% of a cat's diet must be protein.[31] Cats are unusually dependent on a constant supply of the amino acid arginine, and a diet lacking arginine causes marked weight loss and can be rapidly fatal.[69] Another unusual feature is that the cat cannot produce taurine, with taurine deficiency causing macular degeneration, wherein the cat's retina slowly degenerates, causing irreversible blindness.[31] Since cats tend to eat all of their prey, they obtain minerals by digesting animal bones, and a diet composed only of meat may cause calcium deficiency[31].

A cat's gastrointestinal tract is adapted to meat eating, being much shorter than that of omnivores and having low levels of several of the digestive enzymes needed to digest carbohydrates.[70] These traits severely limit the cat's ability to digest and use plant-derived nutrients, as well as certain fatty acids.[70] Despite the cat's meat-oriented physiology, several vegetarian or vegan cat foods have been marketed that are supplemented with chemically synthesized taurine and other nutrients in attempts to produce a complete diet. However, some of these products still fail to provide all the nutrients cats require.[71] and diets containing no animal products pose the risk of causing severe nutritional deficiencies.[72]

Cats do eat grass occasionally. A proposed explanation is that cats use grass as a source of folic acid. Another proposed explanation is that it is used to supply dietary fiber.[73]

### 1.2.6 Senses

*Main article: Cat senses*
Cats have excellent night vision and can see at only one-sixth the light level required for human vision.[54] This is partly the result of cat eyes having a tapetum lucidum, which reflects any light that passes through the retina back into the eye, thereby increasing the eye's sensitivity to dim light.[74] Another adaptation to dim light is the large pupils of cats' eyes. Unlike some big cats, such as tigers, domestic cats have slit pupils.[75] These slit pupils can focus bright light without chromatic aberration, and are needed since the domestic cat's pupils are much larger, relative to their eyes, than the pupils of the big cats.[75] Indeed, at low light levels a cat's pupils will expand to cover most of the exposed surface of its eyes.[76] However, domestic cats have rather poor color vision and (like most nonprimate mammals) have only two types of cones, optimized for sensitivity to blue and yellowish green; they have limited ability to distinguish between red and green.[77] A 1993 paper reported a response to middle wavelengths from a system other than the rods which might be due to a third type of cone. However, this appears to be an adaptation to low light levels rather than representing true trichromatic vision.[78]

Cats have excellent hearing and can detect an extremely broad range of frequencies. They can hear higher-pitched sounds than either dogs or humans, detecting frequencies from 55 Hz to 79,000 Hz, a range of 10.5 octaves, while humans and dogs both have ranges of about 9 octaves.[79][80] Cats can hear ultrasound, which is probably important in hunting rather than intra-specific communication[81] because many species of rodents make ultrasonic calls.[82] Cats' hearing is also sensitive and among the best of any mammal,[79] being most acute in the range of 500 Hz to 32 kHz.[83] This sensitivity is further enhanced by the cat's large movable outer ears (their pinnae), which both amplify sounds and help detect the direction of a noise.[81]

Cats have an acute sense of smell, due in part to their well-developed olfactory bulb and a large surface of olfactory mucosa, about 5.8 cm² (0.90 in²) in area, which is about twice that of humans.[84] Cats are sensitive to pheromones such as 3-mercapto-3-methylbutan-1-ol[85] which they use to communicate through urine spraying and marking with scent glands. [86] Many cats also respond strongly to plants that contain nepetalactone, especially catnip, as they can detect that substance at less than one part per billion.[87] About 70–80% of cats are affected by nepetalactone.[88] This response is also produced by other plants, such as silver vine (Actinidia polygama) and the herb valerian; it may be caused by the smell of these plants mimicking a pheromone and stimulating cats' social or sexual behavior[89]

Cats have relatively few taste buds compared to humans. Domestic and wild cats share a gene mutation that keeps their sweet taste buds from binding to sugary molecules, leaving them with no ability to taste sweetness.[90] Their taste buds instead respond to amino acids, bitter tastes, and acids.[91]

To aid with navigation and sensation, cats have dozens of movable whiskers (vibrissae) over their bodies, especially their faces. These provide information on the width of gaps and on the location of objects in the dark, both by touching objects directly and by sensing air currents; they also trigger protective blink reflexes to protect the eyes from damage.[54][47]
1.2.7 Health

Main article: Cat health

The average lifespan of pet cats has risen in recent years. In the early 1980s it was about seven years,[92] rising to 9.4 years in 1995[93] and 12.1 years in 2013.[94] However, cats have been reported as surviving into their 30s,[95] with the oldest known cat, Creme Puff, dying at a verified age of 38.[96]

Spaying or neutering increases life expectancy: one study found neutered male cats live twice as long as intact males, while spayed female cats live 62% longer than intact females.[92] Non-neutered cats in the U.S. are four times as likely to be hit by a car as a neutered cat, and are three times more likely to require treatment for an animal bite.[94] Having a cat neutered confers health benefits, because castrated males cannot develop testicular cancer, spayed females cannot develop uterine or ovarian cancer; and both have a reduced risk of mammary cancer.[97]

Despite widespread concern about the welfare of free-roaming cats, the lifespans of neutered feral cats in managed colonies compare favourably with those of pet cats.[98] Neutered cats in managed colonies can also live long lives.[100] [101][102][103]

1.2.7.1 Diseases

Cats can suffer from a wide range of health problems, including infectious diseases, parasites, injuries, and chronic disease. Vaccinations are available for many of these diseases, and domestic cats are regularly given treatments to eliminate parasites such as worms and fleas.

1.2.7.2 Poisoning

In addition to obvious dangers such as rodenticides, insecticides, and herbicides, cats may be poisoned by many chemicals usually considered safe by their human guardians because their livers are less effective at some forms of detoxification than those of many other animals, including humans and dogs.[31][105] Some of the most common causes of poisoning in cats are antifreeze and rodent baits.[106] Cats may be particularly sensitive to environmental pollutants.[104][107] When a cat has a sudden or prolonged serious illness without any obvious cause, it has possibly been exposed to a toxin.

Many human medicines should never be given to cats. For example, the painkiller paracetamol (or acetaminophen, sold as Tylenol and Panadol) is extremely toxic to cats: even very small doses need immediate treatment and can be fatal.[108][109] Even aspirin, which is sometimes used to treat arthritis in cats, is much more toxic to them than to humans[109] and must be administered cautiously. Similarly, application of minoxidil (Rogaine) to the skin of cats, either accidentally or by well-meaning guardians attempting to counter loss of fur, has sometimes been fatal.[110] Essential oils can be toxic to cats and cases have been reported of serious illnesses caused by tea tree oil, including flea treatments and shampoos containing it.[111]

Other common household substances that should be used with caution around cats include mothballs and other naphthalene products.[104] Phenol-based products (e.g. Pine-Sol, Dettol (Lysol) or hexachlorophene)[104] are often used for cleaning and disinfecting near cats’ feeding areas or litter boxes, but these can sometimes be fatal.[112] Ethylene glycol, often used as an automotive antifreeze, is particularly appealing to cats, and as little as a teaspoonful can be fatal.[113] Some human foods are toxic to cats; for example chocolate can cause theobromine poisoning although (unlike dogs) few cats will eat chocolate.[114] Large amounts of onions or garlic are also poisonous to cats.[104] Many houseplants are also dangerous such as Philodendron species and the leaves of the Easter lily (Lilium longiflorum), which can cause permanent and life-threatening kidney damage.[116]

1.2.8 Behavior

See also: Cat behavior, Cat communication, and Cat intelligence

Free-ranging cats are active both day and night, although they tend to be slightly more active at night.[117][118] The timing of cats’ activity is quite flexible and varied, which means house cats may be more active in the morning and evening (crepuscular behavior), as a response to greater human activity at these times.[119] Although they spend the majority of their time in the
vicinity of their home, housecats can range many hundreds of meters from this central point, and are known to establish territories that vary considerably in size, in one study ranging from 7 to 28 hectares (17–69 acres).[118]

Cats conserve energy by sleeping more than most animals, especially as they grow older. The daily duration of sleep varies, usually 12–16 hours, with 13–14 being the average. Some cats can sleep as much as 20 hours in a 24-hour period. The term "cat nap" for a short rest refers to the cat’s tendency to fall asleep (lightly) for a brief period. While asleep, cats experience short periods of rapid eye movement sleep often accompanied by muscle twitches, which suggests they are dreaming.[120]

1.2.8.1 Sociability

Although wildcats are solitary, the social behavior of domestic cats is much more variable and ranges from widely dispersed individuals to feral cat colonies that form around a food source, based on groups of co-operating females.[121][122] Within such groups, one cat is usually dominant over the others.[32] Each cat in a colony holds a distinct territory, with sexually active males having the largest territories, which are about 10 times larger than those of female cats and may overlap with several females’ territories.[86] These territories are marked by urine spraying, by rubbing objects at head height with secretions from facial glands, and by defecation.[86] Between these territories are neutral areas where cats watch and greet one another without territorial conflicts. Outside these neutral areas, territory holders usually chase away stranger cats, at first by staring, hissing, and growling, and if that does not work, by short but noisy and violent attacks. Despite some cats cohabiting in colonies, they do not have a social survival strategy, or pack mentality, and always hunt alone.[123]

Domestic cats use many vocalizations for communication, including purring, trilling, hissing, growling/snarling, grunting, and several different forms of meowing.[7] By contrast, feral cats are generally silent.[124][208] Their types of body language, including position of ears and tail, relaxation of whole body, and kneading of paws, are all indicators of mood. The tail and ears are particularly important social signal mechanisms in cats,[125][126] e.g. with a raised tail acting as a friendly greeting, and flattened ears indicating hostility. Tail-raising also indicates the cat’s position in the group’s social hierarchy, with dominant individuals raising their tails less often than subordinate animals.[126] Nose-to-nose touching is also a common greeting and may be followed by social grooming, which is solicited by one of the cats raising and tilting its head.[122]

However, some pet cats are poorly socialized. In particular, older cats may show aggressiveness towards newly arrived kittens, which may include biting and scratching; this type of behavior is known as feline asocial aggression.[127]
Though cats and dogs are believed to be natural enemies, they can live together if correctly socialized. For cats, life in proximity to humans and other animals kept by them amounts to a symbiotic social adaptation. They may express great affection towards their human (and even other) companions, especially if they psychologically imprint on them at a very young age and are treated with consistent affection. Ethologically, the human keeper of a cat may function as a sort of surrogate for the cat’s mother and adult housecats live their lives in a kind of extended kittenhood, a form of behavioral neoteny. The high-pitched sounds housecats make to solicit food may mimic the cries of a hungry human infant, making them particularly hard for humans to ignore.

1.2.8.2 Grooming

The hooked papillae on a cat’s tongue act like a hairbrush to help clean and detangle fur.

Cats are known for spending considerable amounts of time licking their coat to keep it clean. The cat’s tongue has backwards-facing spines about 500 μm long, which are called papillae. These contain keratin which makes them quite rigid so the papillae act like a hairbrush. Some cats, particularly longhaired cats, occasionally regurgitate hairballs of fur that have collected in their stomachs from grooming. These clumps of fur are usually sausage-shaped and about 2–3 cm long. Hairballs can be prevented with remedies that ease elimination of the hair through the gut, as well as regular grooming of the coat with a comb or stiff brush. Some cats can develop a compulsive behavior known as psychogenic alopecia, or excessive grooming.

1.2.8.3 Fighting

Among domestic cats, males are more likely to fight than females. Among feral cats, the most common reason for cat fighting is competition between two males to mate with a female. In such cases, most fights are won by the heavier male. Another common reason for fighting in domestic cats is the difficulty of establishing territories within a small home. Female cats also fight over territory or to defend their kittens. Neutering will decrease or eliminate this behavior in many cases, suggesting that the behavior is linked to sex hormones.

Indicating aggression

When cats become aggressive, they try to make themselves appear larger and more threatening by raising their fur, arching their backs, turning sideways and hissing or spitting. Often, the ears are pointed down and back to avoid damage to the inner ear and potentially listen for any changes behind them while focused forward. They may also vocalize loudly and bare their teeth in an effort to further intimidate their opponent. Fights usually consist of grappling and delivering powerful slaps to the face and body with the forepaws as well as bites. Cats also throw themselves to the ground in a defensive posture to rake their opponent’s belly with their powerful hind legs.
Serious damage is rare, as the fights are usually short in duration, with the loser running away with little more than a few scratches to the face and ears. However, fights for mating rights are typically more severe and injuries may include deep puncture wounds and lacerations. Normally, serious injuries from fighting are limited to infections of scratches and bites, though these can occasionally kill cats if untreated. In addition, bites are probably the main route of transmission of feline immunodeficiency virus.[137] Sexually active males are usually involved in many fights during their lives, and often have decidedly battered faces with obvious scars and cuts to their ears and noses.

1.2.8.4 Hunting and feeding

Cats hunt small prey, primarily birds and rodents,[138] and are often used as a form of pest control.[139][140] Domestic cats are a major predator of wildlife in the United States, killing an estimated 1.4–3.7 billion birds and 6.9–20.7 billion mammals annually.[141][142] The bulk of predation in the United States is done by 80 million feral and stray cats. Effective measures to reduce this population are elusive, meeting opposition from cat enthusiasts.[141][142] In the case of free-ranging pets, equipping cats with bells and not letting them out at night will reduce wildlife predation.[138] Cats wearing one type of device killed 19 times fewer birds than uncollared cats.[143] Free-fed feral cats and house cats tend to consume many small meals in a single day, although the frequency and size of meals varies between individuals.[123] Cats use two hunting strategies, either stalking prey actively, or waiting in ambush until an animal comes close enough to be captured. Although it is not certain, the strategy used may depend on the prey species in the area, with cats waiting in ambush outside burrows, but tending to actively stalk birds.[144]153

Most breeds of cat have a noted fondness for settling in high places, or perching. In the wild, a higher place may serve as a concealed site from which to hunt; domestic cats may strike prey by pouncing from a perch such as a tree branch, as does a leopard.[145] Another possible explanation is that height gives the cat a better observation point, allowing it to survey its territory. During a fall from a high place, a cat can reflexively twist its body and right itself using its acute sense of balance and flexibility.[146] This is known as the cat righting reflex. An individual cat always rights itself in the same way, provided it has the time to do so, during a fall. The height required for this to occur is around 90 cm (3 ft). Cats without a tail (e.g. Manx cats) also have this ability, since a cat mostly moves its hind legs and relies on conservation of angular momentum to set up for landing, and the tail is little used for this feat.[147] This leads to the proverb "a cat always lands on its feet".

One poorly understood element of cat hunting behavior is the presentation of prey to human guardians. Ethologist Paul Leyhausen proposed that cats adopt humans into their social group and share excess kill with others in the group according to the dominance hierarchy in which humans are reacted to as if they are at, or near, the top.[148] Anthropologist and zoologist Desmond Morris, in his 1986 book Catwatching, suggests, when cats bring home mice or birds, they are attempting to teach their human to hunt, or trying to help their human as if feeding "an elderly cat, or an inept kitten".[149][150] Morris's theory is inconsistent with the fact that male cats also bring home prey, despite males having no involvement with raising kittens.[144]153

Domestic cats select food based on its temperature, smell, and texture, strongly disliking chilled foods and responding most strongly to moist foods rich in amino acids, which are similar to meat.[72][123] Cats may reject novel flavors (a response termed neophobia) and learn quickly to avoid foods that have tasted unpleasant in the past.[123] They may also avoid sugary foods and milk; since they are lactose intolerant, these sugars are not easily digested and may cause soft stools or diarrhea.
They can also develop odd eating habits. Some cats like to eat or chew on other things, most commonly wool, but also plastic, paper, string, aluminum foil/Christmas tree tinsel, or even coal. This condition, pica, can threaten their health, depending on the amount and toxicity of the items eaten.

Though cats usually prey on animals more than half their size, a feral cat in Australia had been photographed to kill an adult pademelon weighing around the cat's size at 4 kg (8.8 lb).

Since cats cannot fully close their lips around something to create suction, they use a lapping method with the tongue to draw liquid upwards into their mouths. Lapping at a rate of four times a second, the cat touches the smooth tip of its tongue to the surface of the water, and quickly retracts it, drawing water upward.

1.2.8.5 Play

*Main article: Cat and toys*

Domestic cats, especially young kittens, are known for their love of play. This behavior mimics hunting and is important in helping kittens learn to stalk, capture, and kill prey. Cats also engage in play fighting, with each other and with humans. This behavior may be a way for cats to practice the skills needed for real combat, and might also reduce any fear they associate with launching attacks on other animals.

Owing to the close similarity between play and hunting, cats prefer to play with objects that resemble prey, such as small furry toys that move rapidly, but rapidly lose interest (they become habituated) in a toy they have played with before. Cats also tend to play with toys more when they are hungry. String is often used as a toy, but if it is eaten, it can become caught at the base of the cat's tongue and then move into the intestines, a medical emergency which can cause serious illness, even death. Owing to the risks posed by cats eating string, it is sometimes replaced with a laser pointer's dot, which cats may chase. While concerns have been raised about the safety of playing with lasers, John Marshall, an ophthalmologist at St Thomas' Hospital, has stated it would be "virtually impossible" to blind a cat with a laser pointer.

1.2.8.6 Reproduction

When cats mate, the tomcat (male) bites the scruff of the female's neck as she assumes a position conducive to mating known as lordosis behavior.

*See also: Kitten*

Female cats are seasonally polyestrous, which means they may have many periods of heat over the course of a year, the season beginning in spring and ending in late autumn. Heat periods occur about every two weeks and last about 4 to 7 days. Multiple males will be attracted to a female in heat. The males will fight over her, and the victor wins the right to mate. At first, the female rejects the male, but eventually the female allows the male to mate. The female utters a loud yowl as the male
pulls out of her because a male cat's penis has a band of about 120–150 backwards-pointing penile spines, which are about 1 mm long upon withdrawal of the penis, the spines rake the walls of the female's vagina, which is a trigger for ovulation. This act also occurs to clear the vagina of other sperm in the context of a second (or more) mating, thus giving the later males a larger chance of conception. [citation needed]

After mating, the female washes her vulva thoroughly. If a male attempts to mate with her at this point, the female will attack him. After about 20 to 30 minutes, once the female is finished grooming, the cycle will repeat. [citation needed]

Because ovulation is not always triggered by a single mating, females may not be impregnated by the first male with which they mate. Furthermore, cats are superfecund; that is, a female may mate with more than one male when she is in heat, with the result that different kittens in a litter may have different fathers.

A newborn kitten

At 124 hours after conception, the morula forms. At 148 hours, early blastocysts form. At 10–12 days, implantation occurs.

The gestation period for cats is between 64 and 67 days, with an average of 66 days.[168] The size of a litter usually is three to five kittens, with the first litter usually smaller than subsequent litters. Kittens are weaned between six and seven weeks old, and cats normally reach sexual maturity at 5–10 months (females) and to 5–7 months (males), although this can vary depending on breed. Females can have two to three litters per year, so may produce up to 150 kittens in their breeding span of around ten years.

Cats are ready to go to new homes at about 12 weeks of age when they are ready to leave their mother. They can be surgically sterilized (spayed or castrated) as early as 7 weeks to limit unwanted reproduction. This surgery also prevents undesirable sex-related behavior, such as aggression, territory marking (spraying urine) in males and yowling (calling) in females. Traditionally, this surgery was performed at around six to nine months of age, but it is increasingly being performed prior to puberty, at about three to six months. In the US, about 80% of household cats are neutered.

1.2.8.7 Vocalizations

Main article: Cat communication

The cat is a very vocal animal. Known for its trademark purring, it also produces a wide variety of other sounds.

The mechanism by which cats purr is elusive. The cat has no unique anatomical feature that is clearly responsible for the sound. It was, until recent times, believed that only the cats of the Felis genus could purr. However, felids of the Panthera genus (tiger, lion, jaguar and leopard) also produce sounds similar to purring, but only when exhaling.

1.2.9 Ecology

1.2.9.1 Habitats
A black cat in snowy weather.

Cats are a cosmopolitan species and are found across much of the world.[38] Geneticist Stephen James O’Brien, of the National Cancer Institute in Frederick, Maryland, remarked on how successful cats have been in evolutionary terms: "Cats are one of evolution’s most charismatic creatures. They can live on the highest mountains and in the hottest deserts."[175] They are extremely adaptable and are now present on all continents except Antarctica, and on 118 of the 131 main groups of islands—even on sub-Antarctic islands such as the Kerguelen Islands.[176][177]

Feral cats can live in forests, grasslands, tundra, coastal areas, agricultural land, scrublands, urban areas, and wetlands.[178] Their habitats even include small oceanic islands with no human inhabitants.[179] Further, the close relatives of domestic cats, the African wildcat (Felis silvestris lybica) and the Arabian sand cat (Felis margarita) both inhabit desert environments, [4] and domestic cats still show similar adaptations and behaviors.[31] The cat’s ability to thrive in almost any terrestrial habitat has led to its designation as one of the world’s worst invasive species.[180]

As domestic cats are little altered from wildcats, they can readily interbreed. This hybridization poses a danger to the genetic distinctiveness of some wildcat populations, particularly in Scotland and Hungary and possibly also the Iberian Peninsula. [40]

1.2.9.2 Feral cats

Main article: Feral cat

Feral cats are domestic cats that were born in or have reverted to a wild state. They are unfamiliar with and wary of humans and roam freely in urban and rural areas.[8] The numbers of feral cats is not known, but estimates of the US feral population range from 25 to 60 million.[8] Feral cats may live alone, but most are found in large colonies, which occupy a specific territory and are usually associated with a source of food.[181] Famous feral cat colonies are found in Rome around the Colosseum and Forum Romanum, with cats at some of these sites being fed and given medical attention by volunteers.[82]

Public attitudes towards feral cats vary widely, ranging from seeing them as free-ranging pets, to regarding them as vermin.[183] One common approach to reducing the feral cat population is termed 'trap-neuter-return', where the cats are trapped, neutered, immunized against rabies and the feline leukemia virus, and then released. Before releasing them back into their feral colonies, the attending veterinarian often nips the tip off one ear to mark it as neutered and inoculated, since these cats may be trapped again. Volunteers continue to feed and give care to these cats throughout their lives. Given this support, their lifespans are increased, and behavior and nuisance problems caused by competition for food are reduced.
1.2.9.3 Impact on prey species

To date, few scientific data are available to assess the impact of cat predation on prey populations. Even well-fed domestic cat may hunt and kill, mainly catching small mammals, but also birds, amphibians, reptiles, fish, and invertebrates. Hunting by domestic cats may be contributing to the decline in the numbers of birds in urban areas, although the importance of this effect remains controversial. In the wild, the introduction of feral cats during human settlement can threaten native species with extinction. In many cases, controlling or eliminating the populations of non-native cats can produce a rapid recovery in native animals. However, the ecological role of introduced cats can be more complicated. For example, cats can control the numbers of rats, which also prey on birds' eggs and young, so a cat population can protect an endangered bird species by suppressing mesopredators.

In the Southern Hemisphere, cats are a particular problem in landmasses such as Australasia, where cat species have never been native and few equivalent native medium-sized mammalian predators occurred. Native species such as the New Zealand kakapo and the Australian bettong, for example, tend to be more ecologically vulnerable and behaviorally "naive" to predation by feral cats. Feral cats have had a major impact on these native species and have played a leading role in the endangerment and extinction of many animals.

Cat numbers in the UK are growing and their abundance is far above the "natural" carrying capacity, because their population sizes are independent of their prey’s dynamics: i.e. cats are "recreational" hunters, with other food sources. Population densities can be as high as 2,000 individuals per km² and the trend is an increase of 0.5 million cats annually.

1.2.9.4 Impact on birds

The domestic cat is probably a significant predator of birds. UK assessments indicate they may be accountable for an estimated 64.8 million bird deaths each year. Certain species appear more susceptible than others; for example, 30% of house sparrow mortality is linked to the domestic cat. In the recovery of ringed robins (Erithacus rubecula) and dunnocks (Prunella modularis), 31% of deaths were a result of cat predation. The presence of larger carnivores such as coyotes which prey on cats and other small predators reduces the effect of predation by cats and other small predators such as opossums and raccoons on bird numbers and variety. The proposal that cat populations will increase when the numbers of these top predators decline is called the mesopredator release hypothesis. However, a new study suggests cats are a much greater menace than previously thought and feral cats kill several billion birds each year in the United States.
On islands, birds can contribute as much as 60% of a cat's diet.[197] In nearly all cases, however, the cat cannot be identified as the sole cause for reducing the numbers of island birds, and in some instances, eradication of cats has caused a 'mesopredator release' effect[198] where the suppression of top carnivores creates an abundance of smaller predators that cause a severe decline in their shared prey. Domestic cats are, however, known to be a contributing factor to the decline of many species, a factor that has ultimately led, in some cases, to extinction. The South Island piopio, Chatham Islands rail, [194] the Auckland Islands Merganser,[199] and the common diving petrel[200] are a few from a long list, with the most extreme case being the flightless Stephens Island wren, which was driven to extinction only a few years after its discovery. [201][202]

Some of the same factors that have promoted adaptive radiation of island avifauna over evolutionary time appear to promote vulnerability to non-native species in modern time. The susceptibility of many island birds is undoubtedly due to evolution in the absence of mainland predators, competitors, diseases, and parasites, in addition to lower reproductive rates and extended incubation periods[203] The loss of flight, or reduced flying ability is also characteristic of many island endemics[204] These biological aspects have increased vulnerability to extinction in the presence of introduced species, such as the domestic cat. [205] Equally, behavioral traits exhibited by island species, such as 'predatory naivety'[206] and ground-nesting[203] have also contributed to their susceptibility.

### 1.2.10 Cats and humans

**Main article: Cats and humans**

Cats are common pets in Europe and North America, and their worldwide population exceeds 500 million.[9] Although cat guardianship has commonly been associated with women,[207] a 2007 Gallup poll reported that men and women were equally likely to own a cat[208]

According to the Humane Society of the United States, as well as being kept as pets, cats are also used in the international fur trade,[209] for making coats, gloves, hats, shoes, blankets, and stuffed toys. About 24 cats are needed to make a cat fur coat.[210] This use has now been outlawed in the United States, Australia, and the European Union.[211] However, some cat furs are still made into blankets in Switzerland as folk remedies believed to help rheumatism.[212]

A few attempts to build a cat census have been made over the years, both through associations or national and international organizations (such as the Canadian Federation of Humane Societies's one[213]) and over the net,[214][215] but such a task does not seem simple to achieve. General estimates for the global population of domestic cats range widely from anywhere between 200 million to 600 million[216][217][218][219][220][221]

### 1.2.11 History and mythology

**Main articles: Cultural depictions of cats and Cats in ancient Egypt**

Traditionally, historians tended to think ancient Egypt was the site of cat domestication, owing to the clear depictions of house cats in Egyptian paintings about 3,600 years old[4] However, in 2004, a Neolithic grave excavated in Shillourokambos, Cyprus, contained the skeletons, laid close to one another, of both a human and a cat. The grave is estimated to be 9,500 years old, pushing back the earliest known feline–human association significantly.[11][222][223] The cat specimen is large and closely resembles the African wildcat (F. s. lybica), rather than present-day domestic cats. This discovery, combined with genetic studies, suggests cats were probably domesticated in the Middle East, in the Fertile Crescent around the time of the development of agriculture and then they were brought to Cyprus and Egypt[4]
Direct evidence for the domestication of cats 5,300 years ago in Quanhucun in China has been published. The cats are believed to have been attracted to the village by rodents, which in turn were attracted by grain cultivated and stored by humans.[224]

In ancient Egypt, cats were sacred animals with the goddess Bastet often depicted in cat form, sometimes taking on the war-like aspect of a lioness.[225][226] The Romans are often credited with introducing the domestic cat from Egypt to Europe;[225][227] in Roman Aquitaine, a first- or second-century epitaph of a young girl holding a cat is one of two earliest depictions of the Roman domesticated cat.[226] However, cats possibly were already kept in Europe prior to the Roman Empire, as they may have been present in Britain in the late Iron Age.[42] Domestic cats were spread throughout much of the rest of the world during the Age of Discovery, as they were carried on sailing ships to control shipboard rodents and as good-luck charms.[225][228]

Several ancient religions believed cats are exalted souls, companions or guides for humans, that are all-knowing but mute so they cannot influence decisions made by humans. In Japan, the maneki neko cat is a symbol of good fortune.

Although no species are sacred in Islam, cats are revered by Muslims. Some Western writers have stated Muhammad had a favorite cat, Muezza.[227] He is reported to have loved cats so much, "he would do without his cloak rather than disturb one that was sleeping on it".[228] The story has no origin in early Muslim writers, and seems to confuse a story of a later Sufi saint, Ahmed ar-Rifa‘i centuries after Muhammad.[229]

Freya, the goddess of love, beauty, and fertility in Norse mythology, is depicted as riding a chariot drawn by cats.

Many cultures have negative superstitions about cats. An example would be the belief that a black cat "crossing one's path" leads to bad luck, or that cats are witches' familiars used to augment a witch's powers and skills. The killing of cats in Medieval Ypres, Belgium, is commemorated in the innocuous present-day Kattenstoet (cat parade).[citation needed]

According to a myth in many cultures, cats have multiple lives. In many countries, they are believed to have nine lives, but in Italy, Germany, Greece, and some Spanish-speaking regions, they are said to have seven lives,[230] while in Turkish and Arabic traditions, the number of lives is six.[231] The myth is attributed to the natural suppleness and swiftness cats exhibit to escape life-threatening situations.[232] Also lending credence to this myth is the fact that falling cats often land on their feet, using an instinctive righting reflex to twist their bodies around. Nonetheless, cats can still be injured or killed by a high fall.[233]

1.2.12 See also

- Animal testing on cats
- Animal track
- Cancer in cats
- Cat lady
- Cat years
- List of cat breeds
- List of cats
- List of fictional cats
- Lolcat
- Pet door including cat flap
- Pet first aid
- Popular cat names
- Trap-neuter-return

Cats by location

- Cats in ancient Egypt
- Cats in Australia
- Cats in New Zealand
- Cats in the United States

1.2.13 References

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1. ANAKATEYΘUNΣΗ Πρότυπο:Πλαίσιο πλοήγησης

1.2.14 External links

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Extant Carnivora species

Kingdom: Animalia  ·  Phylum: Chordata  ·  Class: Mammalia  ·  Infraclass: Eutheria  ·  Superorder: Laurasiatheria

Suborder Feliformia

1 ANAKATEYΘUNΣΗ Πρότυπο:Πλαίσιο πλοήγησης

Family Felidae

1 ANAKATEYΘUNΣΗ Πρότυπο:Πλαίσιο πλοήγησης

Family Viverridae (includes Civets)

1 ANAKATEYΘUNΣΗ Πρότυπο:Πλαίσιο πλοήγησης

Family Eupleridae

1 ANAKATEYΘUNΣΗ Πρότυπο:Πλαίσιο πλοήγησης

Suborder Caniformia (cont. below)
Suborder Caniformia (cont. above)

Family Canidae (includes Dogs)

Family Mustelidae
2.1 Giant Schnauzer

The Giant Schnauzer is a working breed of dog developed in the 17th century in Germany. It is the largest of the three breeds of Schnauzer, with the other two breeds being the Standard Schnauzer and the Miniature Schnauzer. Numerous breeds were used in its development, including the black Great Dane, the Bouvier des Flandres and the German Pinscher. Originally bred to assist on farms by driving livestock to market and guarding the farmer’s property, the breed eventually moved into the city, where it worked guarding breweries, butchers’ shops, stockyards and factories. It was unknown outside of Bavaria until it became popular as a military dog during World War I and World War II.

They have dense coarse coat that protects them from the weather and from vermin. Giant Schnauzers come in two color patterns: Solid black, and a color known as pepper and salt, where banded hairs of alternating white and black, appearing gray hairs at a distance. Where legal, they are shown with cropped ears and docked tails. Like other schnauzers, they have a distinct beard and eyebrows. Today, the Giant Schnauzer participates in numerous dog sports, including Schutzhund. It is also used as a police dog.

2.1.1 History

The first Giant Schnauzers emerged from Swabia in the German state of Bavaria, and Württemberg in the 17th century.[1][2] These original Giant Schnauzers were considered a rough-coated version of the German pinscher breeds, and their hair was thought to help them withstand the harsh German winters and bites from vermin.[3] The origins of the breed are unclear, but sources speculate it originated through some combination of black Great Danes,[3] German Shepherds,[3] Rottweilers,[3] Dobermans,[3] Boxers,[3] Bouvier des Flandres,[3] Thuringian Shepherds,[4] and the Standard Schnauzer.[4]

The Giant Schnauzer was originally bred as a multipurpose farm dog for guarding property and driving animals to market.[5] By the turn of the 20th century the Giant Schnauzer was being used as a watchdog at factories, breweries, butcheries, and stockyards throughout Bavaria.[3][2] It was unknown outside Bavaria until it was used as a military dog in World War I and World War II.[3][2] The first Giant Schnauzers were imported to America in the 1930s, but they remained rare until the 1960s.[6] When the breed became popular. In 1962, there were 23 new Giant Schnauzers registered with the American Kennel Club; in 1974 this number was 386; in 1984 it was over 800 and in 1987 was around 1000 animals.[7] In 2012, there were 94 new dogs registered, down from 95 in 2011.[8]

In modern times, the Giant Schnauzer is used as a police dog; is trained for obedience, dog agility, herding, search and rescue, and schutzhund; and is shown in conformation shows.[2][6] They are also used for carting.[5] In Europe, the breed is considered to be more of a working dog than a show dog.[7] The focus in many European Schnauzer clubs is not so much on conformation shows but on the working ability of the breed.[7] In several countries, including Germany, dogs must achieve a Schutzhund Champion title before they can qualify to be a conformation champion.[7]

2.1.2 Description

Two Giant Schnauzers
2.1.2.1 Appearance

Although the Giant Schnauzer is called 'Giant', this is not in comparison to other large dog breeds such as the Great Dane or the Rottweiler, but instead in comparison to the Standard and Miniature Schnauzers.[3] The AKC breed standard calls for males to stand from 25.5 to 27.5 inches (65 to 70 cm) at the withers, and for females to stand from 23.5 to 25.5 inches (60 to 65 cm).[1] Giant Schnauzers are square in shape,[9] and should resemble a larger version of the Standard Schnauzer.[2] The tail is long and the ears are small button ears carried high on the head.[5] Where it is legal, it is possibly docked and the ears cropped.[9]

The head is 1/2 the length of the dog’s back, when the back is measured from the withers to the base of the tail.[2] The cheeks are flat, but well muscled.[2] The coat is dense, wiry, and weather resistant.[9][1] The fur on the Giant Schnauzer's face forms a distinct "beard" and eyebrows.[2] Its stride is long and crisp.[4]

Giant Schnauzers come in two colors: solid black, and a pattern called pepper and salt, where banded hairs of black and white hairs cover the body, giving it the appearance of having been peppered and salted.[1]

2.1.2.2 Temperament

The Giant Schnauzer should be "amiable in repose, and a commanding figure when aroused"[2]

Giant Schnauzers are usually a quiet breed.[4] Due to its breeding, the Giant Schnauzer is inherently suspicious of strangers and can be very territorial.[3][4] Once introduced, it is usually accepting of novel people or situations.[3] It has the potential to be aggressive,[3] but Giant Schnauzers are usually reserved[4] - they are "amiable in repose, and a commanding figure when aroused"[2]

Giant Schnauzers have been described as trustworthy with children.[4] They are very intelligent, and can become bored easily.[3] They are also very energetic and highly spirited,[2] which, when coupled with boredom, can lead to unwanted and destructive behavior.[3] They are easily trained, and deeply loyal to their owner.[2] Some breeders believe that pepper and salt colored Giant Schnauzers are more docile than their black-furred counterparts.[10]

2.1.3 Health

Riesenschauzer or Giant Schnauzer

Giant Schnauzers require regular grooming.[1] Their beard can collect drool and food particles, making frequent cleanings essential.[11] If being shown, their coat needs to be stripped every two to four weeks.[5] If they are simply a companion animal, the coat can be clipped instead.[5] Some Giant Schnauzers have an allergy to shampoo.[12]
Hip and elbow dysplasia are common. Giant Schnauzers are also prone to eye problems such as keratoconjunctivitis sicca, glaucoma, cataracts, multifocal retinal dysplasia and generalized progressive retinal atrophy. They are also prone to skin diseases, such as seasonal flank alopecia, vitiligo, and follicular cysts. Cancer of the skin is common in dark-colored dogs, with the most frequently occurring varieties being melanoma of the limbs and digits, and squamous cell carcinoma of the digit. This susceptibility occurs because melanoma is caused by a defect in the melanocytes, the cells that darken the color of the skin. Noncancerous skin tumors are also common.

Some Giant Schnauzers develop alopecia, vitiligo, and follicular cysts. Some are also sensitive to sulphonamides and gold.

Bone diseases and joint problems are also an issue. The most common causes of death in Giant Schnauzers are lymphoma and liver cancer, followed by heart attacks and heart failure.

### See also

- Standard Schnauzer
- Miniature Schnauzer

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### External links

- Giant Schnauzer at DMOZ

Template:German dogs
2.2 ET161

Wikitext page with Flow board as a discussion page
3.1 Dog

The domestic dog (Canis lupus familiaris) is a usually furry, carnivorous[2][3] member of the canidae family. Domesticated dogs are commonly known as "man's best friend". The dog was the first domesticated animal[4][5] and has been widely kept as a working, hunting, and pet companion. It is estimated there are between 700 million and one billion domestic dogs, making them the most abundant member of order Carnivora.[6][7]

3.1.1 Taxonomy

In 1753, Carl Linnaeus listed among the types of quadrupeds familiar to him the Latin word for dog, canis. Among the species within this genus, Linnaeus listed the fox, as Canis vulpes, wolves (Canis lupus), and the domestic dog, (Canis canis). In later editions, Linnaeus dropped Canis canis and greatly expanded his list of the Canis genus of quadrupeds, and by 1758 included alongside the foxes, wolves, and jackals and many more terms that are now listed as synonyms for domestic dog, including aegyptius (hairless dog), aquaticus, (water dog), and mustelinus (literally "badger dog"). Among these were two that later experts have been widely used for domestic dogs as a species: Canis domesticus and, most predominantly, Canis familiaris the "common" or "familiar" dog[8].

By 1993 with advancements in molecular biology, the mitochondrial DNA mtDNA analysis of extant (i.e. living today) Canidea species indicated that "The domestic dog is an extremely close relative of the gray wolf, differing from it by at most 0.2% of mtDNA sequence.... In comparison, the gray wolf differs from its closest wild relative, the coyote, by about 4% of mitochondrial DNA sequence."[9] In the same year, the domestic dog Canis familiaris was reclassified as Canis lupus familiaris, a subspecies of the gray wolf Canis lupus in Mammal Species of the World.[10] By 1999, further genetic analysis indicated that the domestic dog may have emerged from multiple wolf populations.[11][12] Based on these latest two pieces of research and the reference reclassification, canis lupis familiaris is the name for the taxon listed by ITIS.[13] Reference Origin and Gray wolf

3.1.2 Biology

Main article: Dog anatomy

Domestic dogs have been selectively bred for millennia for various behaviors, sensory capabilities, and physical attributes.[14] Modern dog breeds show more variation in size, appearance, and behavior than any other domestic animal. Nevertheless, their morphology is based on that of their wild wolf ancestors.[14] Dogs are predators and scavengers, and like many other predatory mammals, the dog has powerful muscles, fused wrist bones, a cardiovascular system that supports both sprinting and endurance, and teeth for catching and tearing.
The smallest known adult dog was a Yorkshire Terrier that stood only 6.3 cm (2.5 in) at the shoulder, 9.5 cm (3.7 in) in length along the head-and-body, and weighed only 113 grams (4.0 oz). The largest known dog was an English Mastiff which weighed 155.6 kg (343 lb) and was 250 cm (98 in) from the snout to the tail.[15] The tallest dog is a Great Dane that stands 106.7 cm (42.0 in) at the shoulder.

3.1.2.1 Senses

3.1.2.1.1 Vision

Dog's visual colour perception compared with humans.

Like most mammals, dogs are dichromats and have color vision equivalent to red–green color blindness in humans (deuteranopia).[16][17][18][19][20] So, dogs can see blue and yellow, but have difficulty differentiating red and green because they only have two spectral types of cone photoreceptor, while normal humans have three. And dogs use color instead of brightness to differentiate light or dark blue/yellow.[21][22][23][24] Dogs are less sensitive to differences in grey shades than humans and also can detect brightness at about half the accuracy of humans.[25][26]

The dog's visual system has evolved to aid proficient hunting.[16] While a dog's visual acuity is poor (that of a poodle's has been estimated to translate to a Snellen rating of 20/75[16]), their visual discrimination for moving objects is very high; dogs have been shown to be able to discriminate between humans (e.g., identifying their human guardian) at a range of between 850 and 900 m, however this range decreases to 500–600 m if the object is stationary.[16]

Dogs have a temporal resolution of between 60 and 70 Hz. This means that domestic dogs are unlikely to perceive modern TV screens in the same way as humans because these are optimized for humans at 50–60 Hz.[25] Dogs can detect a change in movement that exists in a single diopter of space within their eye. Humans, by comparison, require a change of between 10 and 20 diopters to detect movement.[27]

As crepuscular hunters, dogs often rely on their vision in low light situations: They have very large pupils, a high density of rods in the fovea, an increased flicker rate, and a tapetum lucidum.[16] The tapetum is a reflective surface behind the retina that reflects light to give the photoreceptors a second chance to catch the photons. There is also a relationship between body size and overall diameter of the eye. A range of 9.5 and 11.6 mm can be found between various breeds of dogs. This 20% variance can be substantial and is associated as an adaptation toward superior night vision.[16][18]

The eyes of different breeds of dogs have different shapes, dimensions, and retina configurations.[29] Many long-nosed breeds have a "visual streak"—a wide foveal region that runs across the width of the retina and gives them a very wide field of excellent vision. Some long-muzzled breeds, in particular, the sighthounds, have a field of vision up to 270° (compared to 180° for humans). Short-nosed breeds, on the other hand, have an "area centralis": a central patch with up to three times the density of nerve endings as the visual streak, giving them detailed sight much more like a human's. Some broad-headed breeds with short noses have a field of vision similar to that of humans.[17][18]

Most breeds have good vision, but some show agenic predisposition for myopia—such as Rottweilers, with which one out of every two has been found to be myopic.[16] Dogs also have a greater divergence of the eye axis than humans, enabling them to rotate their pupils farther in any direction. The divergence of the eye axis of dogs ranges from 12–25° depending on the breed.[27]
Experimentation has proven that dogs can distinguish between complex visual images such as that of a cube or a prism. Dogs also show attraction to static visual images such as the silhouette of a dog on a screen, their own reflections, or videos of dogs; however, their interest declines sharply once they are unable to make social contact with the image.

### 3.1.2.1.2 Hearing

![The physiology of a dog ear.](image)

The frequency range of dog hearing is approximately 40 Hz to 60,000 Hz[^31] which means that dogs can detect sounds far beyond the upper limit of the human auditory spectrum[^32]. In addition, dogs have ear mobility, which allows them to rapidly pinpoint the exact location of a sound[^33]. Eighteen or more muscles can tilt, rotate, raise, or lower a dog’s ear. A dog can identify a sound’s location much faster than a human can, as well as hear sounds at four times the distance. [http://www.k9puppydogs.com/html/dog_sense_of_hearing.htm][34]

### 3.1.2.1.3 Smell

![The wet, textured nose of a dog](image)

While the human brain is dominated by a large visual cortex, the dog brain is dominated by an olfactory cortex[^16]. The olfactory bulb in dogs is roughly forty times bigger than the olfactory bulb in humans, relative to total brain size, with 125 to 220 million smell-sensitive receptors[^16].

Consequently, it has been estimated that dogs, in general, have an olfactory sense ranging from one hundred thousand to one million times more sensitive than a human[^35][36][4]. In some dog breeds, such as bloodhounds, the olfactory sense may be up to 100 million times greater than a human’s[^37]. The wet nose, or rhinarium, is essential for determining the direction of the air current containing the smell. Cold receptors in the skin are sensitive to the cooling of the skin by evaporation of the moisture by air currents[^38].

### 3.1.2.2 Physical characteristics
3.1.2.1 Coat

Main article: Coat (dog)

A heavy winter coat with countershading in a mixed-breed dog

The coats of domestic dogs are of two varieties: "double" being common with dogs (as well as wolves) originating from colder climates, made up of a coarse guard hair and a soft down hair, or "single", with the topcoat only.

Domestic dogs often display the remnants of countershading, a common natural camouflage pattern. A countershaded animal will have dark coloring on its upper surfaces and light coloring below, which reduces its general visibility. Thus, many breeds will have an occasional "blaze", stripe, or "star" of white fur on their chest or underside.

Tails

In some breeds puppies can be born with a short tail or no tail at all

3.1.2.3 Types and breeds

Main article: Dog breed
Further information: Dog type

Cavalier King Charles Spaniels demonstrate within-breed variation.

Most breeds of dog are at most a few hundred years old, having been artificially selected for particular morphologies and behaviors by people for specific functional roles. Through this selective breeding, the dog has developed into hundreds of varied breeds, and shows more behavioral and morphological variation than any other land mammal. For example, height measured to the withers ranges from 15.2 centimetres (6.0 in) in the Chihuahua to about 76 cm (30 in) in the Irish Wolfhound; color varies from white through grays (usually called "blue") to black, and browns from light (tan) to dark ("red" or "chocolate") in a wide variation of patterns; coats can be short or long, coarse-haired to wool-like, straight, curly, or smooth. It is common for most breeds to shed this coat.

While all dogs are genetically very similar, natural selection and selective breeding have reinforced certain characteristics in certain populations of dogs, giving rise to dog types and dog breeds. Dog types are broad categories based on function, genetics, or characteristics. Dog breeds are groups of animals that possess a set of inherited characteristics that
distinguishes them from other animals within the same species. Modern dog breeds are non-scientific classifications of dogs kept by modern kennel clubs.

Purebred dogs of one breed are genetically distinguishable from purebred dogs of other breeds,[44] but the means by which kennel clubs classify dogs is unsystematic. Systematic analyses of the dog genome has revealed only four major types of dogs that can be said to be statistically distinct.[44] These include the "old world dogs" (e.g., Malamute and Shar Pei), "Mastiff"-type (e.g., English Mastiff), "herding"-type (e.g., Border Collie), and "all others" (also called "modern"- or "hunting"-type)[44][45]

### 3.1.3 See also (as well)

- Animal track
- Argos (dog)
- Dog in Chinese mythology
- Dogs in art
- Dog odor
- Dognapping
- Ethnocynology
- Hachikō—a notable example of dog loyalty
- Lost pet services
- Wolfdog

### Lists

- List of dog breeds
- List of fictional dogs
- List of individual dogs
- List of most popular dog breeds

### 3.1.4 References

Scientist (online) the canine genome shows how tiny genetic changes can create enormous variation within a single species.
3.1.5 Bibliography


3.1.6 Further reading


3.1.7 External links

- Biodiversity Heritage Library bibliography for *Canis lupus familiaris*
- Fédération Cynologique Internationale (FCI) – World Canine Organisation
- View the dog genome on Ensembl

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