

# European rabbit

Oryctolagus\_cuniculus\_Tasmania\_2\_(cropped).jpg

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## Scientific classification [Edit this classification](#)

|          |   |
|----------|---|
| Domain:  | <a href="#">Eukaryota</a>                 |
| Kingdom: | <a href="#">Animalia</a>                  |
| Phylum:  | <a href="#">Chordata</a>                  |
| Class:   | <a href="#">Mammalia</a>                  |
| Order:   | <a href="#">Lagomorpha</a>                |
| Family:  | <a href="#">Leporidae</a>                 |
| Genus:   | <a href="#">Oryctolagus</a>               |
| Species: | <b><i>O. cuniculus</i></b> <sup>[1]</sup> |

The **European rabbit** (*Oryctolagus cuniculus*) or **coney**<sup>[4]</sup> is a species of [rabbit](#) native to the [Iberian Peninsula](#) ([Spain](#), [Portugal](#) and [Andorra](#)) and southwestern [France](#).<sup>[3]</sup> It is the only extant species in the genus *Oryctolagus*. The European rabbit has faced a population decline in its native range due to [myxomatosis](#), [rabbit hemorrhagic disease](#), overhunting and habitat loss. Outside of its native range, it is known as an [invasive species](#), as it has been introduced to countries on all continents with the exception of Antarctica, often with devastating effects on local [biodiversity](#) due to a lack of predators.

The average adult European rabbit is 40 cm (16 in) in length, and can weigh 1.2–2.0 kg (2.6–4.4 lb), though size and weight vary with habitat and diet. Its distinctive ears can measure up to 6.5–7.5 cm (2.6–3.0 in) from the [occiput](#). Due to the European rabbit's history of [domestication](#), [selective breeding](#), and introduction to non-native habitats, [feral](#) European rabbits across the world display a wide variety of [morphologies](#).

The European rabbit is well known for digging networks of [burrows](#), called warrens, where it spends most of its time when not feeding. It is a [gregarious](#) species, and lives in social groups centered around territorial females. European rabbits in an established social group will rarely stray far from their warren, with female rabbits leaving the warren mainly to establish nests where they will raise

their young. Unlike [hares](#) (*Lepus* spp.), rabbits are [altricial](#) and are born blind, requiring maternal care until they leave the nest after 18 days.

Much of the modern research into wild rabbit behaviour was carried out in the 1960s by two research centres. One was the naturalist [Ronald Lockley](#), who maintained a number of large enclosures for wild rabbit colonies, with observation facilities at [Orierton, in Pembrokeshire](#), Wales. Apart from publishing a number of scientific papers, he popularised his findings in a book *The Private Life of the Rabbit*, which is credited by [Richard Adams](#) as having played a key role in his gaining "a knowledge of rabbits and their ways" that informed his novel *Watership Down*. The other group was the [Commonwealth Scientific and Industrial Research Organisation](#) (CSIRO) in [Australia](#), where numerous studies of the social behaviour of wild rabbits were performed. Since the onset of myxomatosis, and the decline of the significance of the rabbit as an agricultural pest, few large-scale studies have been performed and many aspects of rabbit behaviour are still poorly understood.

## Naming and etymology

Because of its non-British origin, the species does not have native names in [English](#) or [Celtic](#), with the usual terms "cony" and "rabbit" being foreign [loanwords](#). "Rabbit" is also pronounced as *rabbidge*, *rabbert* ([North Devon](#)) and *rappit* ([Cheshire](#) and [Lancashire](#)). More archaic spellings include *rabbette* (15th–16th centuries), *rabet* (15th–17th centuries), *rabbet* (16th–18th centuries), *rabatte* (16th century), *rabytt* (17th century) and *rabit* (18th century). The [root word](#) is the [Walloon](#) *rabett*, which was once commonly used in [Liège](#). *Rabett* itself is derived from the [Middle Dutch](#) *robbe*, with the addition of the [suffix](#) *-ett*.<sup>[5]</sup>

The term "cony" or "coney" antedates "rabbit", and first occurred during the 13th century to refer to the animal's pelt. Later, "cony" referred to the adult animal, while "rabbit" referred to the young. The root of "cony" is the [old French](#) *connil* or *counil*,<sup>[6]</sup> of which the [Norman](#) was *conin*, plural *coniz* or *conis*.<sup>[7]</sup> *Connil* comes from the [Latin](#) *cuniculus*.<sup>[6]</sup> Its forerunner is the [Greek](#) κόνικλος (*kóniklos*). The origin of κόνικλος itself is unclear: [Ælian](#), who lived during the third century, linked the word to [Celtiberian](#) and later authors relate it to its [Basque](#) name *unchi*; [Varo](#) and [Pliny](#) connected it to *cuneus*, which refers to a wedge, thus making reference to the animal's digging ability.<sup>[5]</sup> Later study of the etymology of *cuniculus* has attested to its origin as a diminutive or adjectival form of the root word for "dog" (*cun-*) in Celtiberian.<sup>[8]</sup>

The species' dwelling place is termed a warren or cony-garth. "Warren" comes from the [Old English](#) *wareine*, itself derived from the Old French *warene*, *varenne*, or *garenne*. The root word is the [Low Latin](#) *warenna*, which originally signified a preserve in general, only to be later used to refer

specifically to an enclosure set apart for rabbits and hares.[9] "Cony-garth" derives from the [Middle English](#) *conygerthe*, which may be a [compound](#) of *connyng*+*erthe* (cony+earth). The term stems from the Old French *conniniere* or *coninyere*, and later *conilliere*. The root word is the Low Latin *cunicularia*, the feminine form of the [adjective](#) *cunicularius*, which pertains to the rabbit (as in the [specific name](#), *cuniculus*[8]).[5] The [generic name](#), *Oryctolagus*, derives from [Ancient Greek](#): ὄρυκτός (*oryktos*, "burrowing") and λαγώς (*lagōs*, "hare").[10]

# Taxonomy

Originally assigned to the genus [Lepus](#), the European rabbit was consigned to its own genus in 1874 on account of its [altricial](#) young, its burrowing habits, and numerous skeletal characters.[11] It is superficially similar to the North American [cottontails](#) (*Sylvilagus*) in that they are born blind and naked, have white flesh, and little [sexual dimorphism](#). However, they differ in skull characteristics, and cottontails do not construct their own burrows as the European rabbit does.[12] Molecular studies confirm that the resemblance between the two is due to [convergent evolution](#), and that the European rabbit's closest relatives are the [hispid hare](#) (*Caprolagus hispidus*), the [riverine rabbit](#) (*Bunolagus monticularis*), and the [Amami rabbit](#) (*Pentalagus furnessi*).[13]

The following [cladogram](#) is from Matthee et al., 2004, based on nuclear and mitochondrial gene analysis.[14]



In 2005, six [subspecies](#) were recognised in [Mammal Species of the World](#):<sup>[15]</sup>

- **Common rabbit** *O. c. cuniculus*
- **Iberian rabbit** *O. c. algirus*
- **Mediterranean rabbit** *O. c. huxleyi*
- **Cretan rabbit** *O. c. cnoossius*
- **Camargue rabbit** *O. c. brachyotus*
- **African rabbit** *O. c. habetensis*

Genetic studies undertaken in 2008, however, indicate only two extant subspecies, *O. c. algirus* and *O. c. cuniculus*, native to the Iberian Peninsula, where most of the European rabbit's evolutionary history is centered;<sup>[16]</sup> as of 2023, only these two subspecies are recognized.<sup>[3]</sup> *O. c. algirus* and *O. c. cuniculus* occupy the south-west and north-east regions of the peninsula, respectively, naturally coming in contact in a region that spans the north-west to south-east,<sup>[17]</sup> and likely diverged during the [Quaternary glaciation](#) 2 million years ago.<sup>[18]</sup> Subspecies other than *O. c. algirus* and *O. c. cuniculus* have been recommended for abandonment, as they have very little evolutionary history and [genetic diversity](#), and are likely not [indigenous](#) to the regions they occupy. Populations considered native to North Africa, such as those considered part of the subspecies *O. c. habetensis*, were likely introduced by [Phoenicians](#) navigating the [Mediterranean Sea](#);<sup>[16]</sup> they are considered to be *O. c. cuniculus*, as are most other populations in regions the European rabbit was introduced to.<sup>[3]</sup>

There is also debate as to the degree that leopard geckos interact with [conspecifics](#) in the wild. Academic sources have asserted that leopard geckos live in loose colonies in the wild.<sup>[5][9]</sup> Pet keeping guides often claim these geckos are solitary and do not usually live with other animals.<sup>[14]</sup> <sup>[4]</sup> Acknowledging the latter as a myth propagated by pet keepers, Philippe de Vosjoli—a prominent leopard gecko breeder and author of dozens of books on reptile husbandry—has asserted that "The claims of some internet 'experts' that leopard geckos in the wild live singly... is not supported by facts".<sup>[4]</sup>

## Fossil record

The oldest known fossils of the currently living European rabbit species, *Oryctolagus cuniculus*, appeared in the [Middle Pleistocene](#) age in southern Spain. The first identifiable fossils from *Oryctolagus* appeared during the [Miocene](#) epoch, and species such as *O. laynensis*, a presumed ancestor of *O. cuniculus*, and *O. lacosti* were recorded from 3.5 [Mya](#) up until the appearance of *O. cuniculus* 0.6 Mya. However, the European rabbit was the only member of its genus to survive to the [Late Pleistocene](#), whereupon it spread from the [Iberian Peninsula](#) to the [Mediterranean](#) and northern Europe.<sup>[2]</sup> [Palaeoichnological](#) evidence exists of European rabbits burrowing in and

disturbing what are likely [Neanderthal](#) burial sites.<sup>[22]</sup>

# Description

The European rabbit is smaller than the [European hare](#) and [mountain hare](#), and lacks black ear tips, as well as having proportionately shorter legs.<sup>[24]</sup> An adult European rabbit can measure 40 cm (16 in) in length, and weigh 1.2–2.0 kg (2.6–4.4 lb). The hind foot measures 8.5–10 cm (3.3–3.9 in) in length, while the ears are 6.5–7.5 cm (2.6–3.0 in) long from the [occiput](#).<sup>[25]</sup>

Size and weight vary according to food and habitat quality, with rabbits living on light soil with nothing but grass to feed on being noticeably smaller than specimens living on highly cultivated farmlands with plenty of roots and clover. Pure European rabbits weighing 5 kg (11 lb) and upwards are uncommon, but are occasionally reported. One large specimen, caught in February 1890 in [Lichfield](#), was weighed at 2.8 kg (6 lb 2 oz).<sup>[26]</sup> Unlike the brown hare, the male European rabbit is more heavily built than the female.<sup>[27]</sup> The [penis](#) is short, and lacks a [baculum](#) and true [glans](#);<sup>[11]</sup> the [testicles](#), which are located in scrotal sacs to each side of the penis, can be retracted into the abdomen when food is scarce or when sexually inactive. Rudimentary nipples are also present in male rabbits.<sup>[28]</sup>

The fur of the European rabbit is made up of soft [down hair](#) covered by stiff [guard hairs](#),<sup>[28]</sup> and is generally greyish-brown, though this is subject to much variation. The guard hairs are banded brown and black, or grey, while the [nape](#) of the neck and [scrotum](#) are reddish. The chest patch is brown, while the rest of the underparts are white or grey. A white star shape is often present on kits' foreheads, but rarely occurs in adults. The [whiskers](#) are long and black, and the feet are fully furred and buff-coloured.<sup>[11]</sup> The tail has a white underside, which becomes prominent when escaping danger. This may act as a signal for other rabbits to run.<sup>[26]</sup>

[Moulting](#) occurs once a year, beginning in March on the face and spreading over the back. The underfur is completely replaced by October–November.<sup>[11]</sup> The European rabbit exhibits great variation in colour, from light sandy, to dark grey and completely black. Such variation depends largely on the amount of guard hairs relative to regular pelage. [Melanists](#) are not uncommon in [mainland Europe](#), though [albinoes](#) are rare.<sup>[23]</sup>

[Oryctolagus cuniculus skull in profile view](#)

*O. cuniculus* skull in profile

The skeleton and musculature of the European rabbit, like other leporids, is suited to survival by rapid escape from predators. The hind limbs are an exaggerated feature, being much longer and capable of producing more force than the forelimbs;<sup>[29]</sup> their growth and use is correlated to that of the rest of the rabbit's body, as action pressure from the muscles creates force that is then

distributed through the skeletal structures. Underuse of the rabbit's muscles leads to [osteoporosis](#) via bone [rarefaction](#).<sup>[30]</sup> The skull of the European rabbit displays a significant facial tilt of roughly 45° forward relative to the [basicranium](#) at rest, which supports their locomotion being mainly jumping or hopping (saltorial) rather than running (cursorial).<sup>[31]</sup>

# Life history and behaviour

## Social and territorial behaviours

The European rabbit lives in warrens that contain 2–10 other individuals living in smaller groups to ensure greater breeding success.<sup>[32]</sup> [Territoriality](#) and aggression contribute greatly to the rabbits' maturation process, and help ensure survival of the population.<sup>[33]</sup> Females tend to be more territorial than males, although the areas most frequented by females are not defended.<sup>[34]</sup>

Territories are marked with dung hills.<sup>[35]</sup> The size of the species' [home range](#) varies according to habitat, food, shelter, cover from predators, and breeding sites, though it is generally small, encompassing about 4 ha (9.9 acres).<sup>[36]</sup> Except during times of low rabbit density and abundance of high-quality food, male ranges tend to be larger than those held by females. The European rabbit rarely strays far from its burrow; when feeding on cultivated fields, it typically only moves 25 m (82 ft) away from its burrow, and rarely 50 m (160 ft). It may, however, move as far as 500 m (1,600 ft) after an abrupt change in environment, such as a [harvest](#). This behaviour may be an antipredator adaptation, as rabbits in areas where predators are under rigorous control may move three times further from their burrows than those in areas without predator management.<sup>[37]</sup>

The European rabbit is a gregarious animal, which lives in stable social groups centred around females and sharing access to one or more burrow systems. Social structures tend to be looser in areas where burrow construction is relatively easy. [Dominance hierarchies](#) exist in parallel for both bucks and does. Among bucks, status is determined through access to does, with dominant bucks siring the majority of the colony's offspring. The dominant does have priority access to the best nesting sites, with competition over such sites often leading to serious injury or death. Subordinate does, particularly in large colonies, typically resort to using single-entrance breeding spots far from the main warren,<sup>[37]</sup> or may abandon the warren entirely,<sup>[38]</sup> thus making themselves vulnerable to [fox](#) or [badger](#) predation.<sup>[37]</sup>

## Reproduction and development

In the European rabbit's [mating system](#), dominant bucks exhibit [polygyny](#),<sup>[39]</sup> whereas lower-status individuals (both bucks and does) often form [monogamous](#) breeding relationships. <sup>[*citation needed*]</sup> Rabbits signal their readiness to copulate by marking other animals and inanimate objects with an odoriferous substance secreted through a chin gland, in a process known as "chinning".<sup>[40]</sup> Though

male European rabbits may sometimes be amicable with one another, fierce fights can erupt among bucks during the [breeding season](#),<sup>[41]</sup> which typically starts in [autumn](#) and continues through to [spring](#). Occasionally, the mating season will extend into the [summer](#). Introduced populations in the [Southern Hemisphere](#) experience breeding seasons during the other half of the [calendar year](#).<sup>[42]</sup> A succession of 4 to 5 litters (usually three to seven kittens each,<sup>[43]</sup> on average five) are produced annually,<sup>[36]</sup> but in overpopulated areas, pregnant does may lose all their [embryos](#) through intrauterine resorption.<sup>[43]</sup> Shortly before giving birth, the doe constructs a separate burrow known as a "stop" or "stab", generally in an open field away from the main warren. These breeding burrows are typically a few feet long and are lined with grass and moss, as well as fur plucked from the doe's belly. The breeding burrow protects the kits from adult bucks and predators.<sup>[44]</sup>

The [gestation period](#) of the European rabbit is 30 days,<sup>[45][36]</sup> with the [sex ratio](#) of male to female kits tending to be 1:1. Greater maternal investment over male offspring may result in higher [birth weights](#) for bucks.<sup>[43]</sup> Kits born to the dominant buck and doe—which enjoy better nesting and feeding grounds—tend to grow larger and stronger and become more dominant than those born to subordinate rabbits.<sup>[46]</sup> Not uncommonly, European rabbits mate again immediately after giving birth, with some specimens having been observed to nurse previous young whilst pregnant.<sup>[45]</sup> Female European rabbits may become pregnant at three months of age, but do not reach their full reproductive ability until they are two years old, after which they remain able to reproduce for 4 more years.<sup>[42]</sup>

Female European rabbits nurse their kits once a night, for only a few minutes. After suckling is complete, the doe seals the entrance to the stop with soil and vegetation. In its native Iberian and southern French range, European rabbit young have a growth rate of 5 g (0.18 oz) per day, though such kittens in non-native ranges may grow 10 g (0.35 oz) per day. Weight at birth is 30–35 g (1.1–1.2 oz) and increases to 150–200 g (5.3–7.1 oz) by 21–25 days, during the [weaning](#) period.<sup>[43]</sup> European rabbit kits are born blind, deaf, and nearly naked. The ears do not gain the power of motion until 10 days of age, and can be erected after 13. The eyes open 11 days after birth.<sup>[45][42]</sup> At 18 days, the kittens begin to leave the burrow. [Sexual maturity](#) in bucks is attained at 4 months, while does can begin to breed at 3–5 months.<sup>[43]</sup>

## Dewlaps

A [dewlap](#) is a longitudinal flap of skin or similar flesh that hangs beneath the [lower jaw](#) or [neck](#). It is a [secondary sex characteristic](#) in rabbits, caused by the presence of female sex hormones. They develop with [puberty](#). A female rabbit who has been [neutered](#) before reaching sexual maturity will not develop a dewlap, and even if a doe is neutered after developing a dewlap, the dewlap will gradually disappear over several months. This also aligns with the results of injecting male rabbits with female sex hormones, specifically the ones from pregnant women's [urine](#). The male rabbits

developed dewlaps, which then gradually disappeared once administration had ceased.<sup>[47][a]</sup> While it is unclear exactly what function a dewlap performs, pregnant female rabbits will pluck fur from their dewlaps shortly before giving birth to line a nest for their young.<sup>[49]</sup>

## Burrowing behaviour

The European rabbit's burrows occur mostly on slopes and banks, where [drainage](#) is more efficient. The burrow entrances are typically 10–50 cm (4–20 in) in diameter,<sup>[24]</sup> and are easily recognisable by the bare earth at their mouths. Vegetation growth is prevented by the constant passing and re-passing of the resident rabbits. Big burrows are complex excavations which may descend to depths of several feet. They are not constructed on any specified plan, and appear to be enlarged or improved as a result of the promiscuous activity of several generations. Digging is done by pulling the soil backwards with the fore feet and throwing it between the hind legs, which scatter the material with kicking motions. While most burrows are dug from the outside, some warrens feature holes dug from the inside, which act as emergency exits when escaping from predators below ground. These holes usually descend perpendicularly to 1–1.2 m (3–4 ft), and their mouths lack the bare-earth characteristic of burrow entrances. While kits sleep in chambers lined with grass and fur, adults sleep on the bare earth, likely to escape dampness, with warmth being secured by [huddling](#).<sup>[50]</sup> Although both sexes dig, does do so more skillfully, and for longer periods.<sup>[51]</sup>

## Communication

The European rabbit is a relatively quiet animal, though it has at least two vocalisations. The best-known is a high treble scream or squeal.<sup>[52]</sup> This distress call has been likened to the cry of a piglet.<sup>[53]</sup> This sound is uttered when in extreme distress, such as being caught by a predator or trap.<sup>[52]</sup> During the spring, bucks express contentment by emitting grunting sounds when approaching other rabbits. These grunts are similar to shrill [hiccups](#), and are emitted with the mouth closed. Aggression is expressed with a low growl.<sup>[53]</sup>

## Ecology

### Habitat

The European rabbit's ideal habitat consists of short grasslands with secure refuge (such as burrows, boulders, hedgerows, scrub, and woodland) near feeding areas. It may dwell up to [treeline](#), as long as the land is well-drained and shelter is available. The size and distribution of its burrow systems depend on the type of [soil](#) present. In areas with loose soil, it selects sites with supporting structures, such as tree roots or shrubs to prevent burrow collapse. Warrens tend to be larger and

have more interconnected tunnels in areas with [chalk](#) than those in sand. In large coniferous plantations, the species only occurs on peripheral areas and along fire breaks and rides.<sup>[54]</sup> The European rabbit's grazing habits tend to promote their ideal open grassland habitat via the dispersion of seeds and trimming of vegetation.<sup>[38]</sup>

## Diet

The European rabbit eats a wide variety of [herbage](#), especially [grasses](#), favouring the young, succulent leaves and shoots of the most nutritious species, particularly [fescues](#). In mixed cultivated areas, [winter wheat](#) is preferred over [maize](#) and [dicotyledons](#). During the summer, the European rabbit feeds on the shortest, and therefore less nutritious grass swards, thus indicating that grazing grounds are selected through antipredator considerations rather than maximising food intake.<sup>[</sup><sup>*citation needed*]</sup> In times of scarcity, the rabbit increases its food intake, selecting the parts of the plant with the highest [nitrogen](#) content.<sup>[55]</sup> Hungry rabbits in winter may resort to eating [tree bark](#). [Blackberries](#) are also eaten, and captive-bred European rabbits have been fed on [fodder](#) consisting of [furze](#) and [acorns](#), which can lead to considerable weight gain.<sup>[56]</sup> The European rabbit is a less fussy eater than the brown hare. When eating [root vegetables](#), the rabbit eats them whole, while the hare tends to leave the peel.<sup>[57]</sup> Depending on the body's fat and protein reserves, the species can survive without food in winter for about 2–8 days.<sup>[55]</sup> Although [herbivorous](#), cases are known of rabbits eating [snails](#).<sup>[56]</sup>

Like other leporids, the European rabbit produces soft, mucus-covered faecal pellets, which are ingested directly from the [anus](#).<sup>[55]</sup> The soft pellets are produced posterior to the [colon](#) in the [hind gut](#) soon after the excretion of hard pellets and the stomach begins to fill with newly grazed food. The soft pellets are filled with [protein](#)-rich [bacteria](#), and pass down to the rectum in glossy clusters. The rabbit swallows them whole, without perforating the enveloping membrane.<sup>[58]</sup>

## Predators

The European rabbit is prey to many different predatory species. [Foxes](#), [dingoes](#), [wolves](#), [lynxes](#), [wolverines](#), and [dogs](#) kill both adult and young rabbits by stalking and surprising them in the open, but relatively few rabbits are caught this way, as they can quickly rush back to cover with a burst of speed.<sup>[59]</sup> Further, evidence from a study in Spain suggests they may avoid areas where the recent [scat](#) of predators which have eaten rabbit is detected.<sup>[60]</sup> Both foxes and [badgers](#) dig out kittens from shallow burrows, with the latter predators being too slow to catch adult rabbits. Both [wild](#) and [domestic cats](#) can stalk and leap upon rabbits, particularly young specimens leaving their burrows for the first time.<sup>[59]</sup> Wildcats take rabbits according to availability; in eastern Scotland, where rabbits are abundant, they can make up over 90% of the wildcats' diet.<sup>[25]</sup> Most domestic

cats are incapable of killing healthy, full-grown adults, but will take weak and diseased ones. Does can be fiercely protective of their kits, having been observed to chase away large cats and [mustelids](#), including [ferrets](#), [stoats](#), and [weasels](#). However, rabbits typically run from mustelids, and may fear them innately. Cases are known of rabbits becoming paralysed with fear and dying when pursued by stoats or weasels, even when rescued unharmed.<sup>[59]</sup>

The European rabbit makes up 85% of the [polecat](#)'s diet, and its availability is important to the success of breeding female [mink](#).<sup>[25]</sup> [Brown rats](#) can be a serious threat to kittens, as they will reside in rabbit burrows during the summer, and attack them in groups.<sup>[61][62]</sup> Although many [birds of prey](#) are capable of killing rabbits, few are strong enough to carry them. Large species, such as [golden](#) and [sea eagles](#), may carry rabbits back to their nests, while small eagles, [buzzards](#), and [harriers](#) struggle to do so. [Hawks](#) and [owls](#) typically only carry off very small kits.<sup>[59]</sup> Due to its decline in the Iberian Peninsula, the [Iberian lynx](#) (*Lynx pardinus*) and [Spanish imperial eagle](#) (*Aquila adalberti*), [specialist predators](#) of the European rabbit,<sup>[38]</sup> have faced subsequent downturns in population.<sup>[63][64]</sup>

## Diseases, parasites and immunity

The European rabbit is the only species fatally attacked by [myxomatosis](#). The most lethal strain has a five-day incubation period, after which the eyelids swell, with the inflammation quickly spreading to the base of the ears, the forehead, and nose. At the same time, the anal and genital areas also swell. During the last stages of the disease, the swellings discharge a fluid rich in viral material, with death usually following on the 11th–12th day of infection.<sup>[65]</sup> The primary carrier of myxomatosis varies based on location; in North America and Australia, it is carried by multiple species of [mosquitoes](#),<sup>[66][67][68]</sup> while in Britain its primary carrier is the [rabbit flea](#) (*Spilopsyllus cuniculi*).<sup>[69]</sup>

[Rabbit haemorrhagic disease](#) (RHD), also known as viral haemorrhagic disease or rabbit calicivirus disease in Australia, is specific to the European rabbit, and causes lesions of acute necrotising [hepatitis](#), disseminated intravascular coagulation, and haemorrhaging, mainly in the lungs. Susceptible specimens may die within 30 hours of infection. Most rabbits in the UK are immune to RHD, due to exposure to a weaker strain.<sup>[70][71]</sup>

European rabbit immunity has significantly diverged from other [tetrapods](#) in the manner in which it employs [immunoglobulin light chains](#).<sup>[72][73]</sup> In one case, McCartney-Francis (*et al.*, 1984) discovered a unique additional [disulfide bond](#) between Cys 80 in Vk and Cys 171 in Ck. They suggest that this may serve to stabilise rabbit antibodies.<sup>[72][73]</sup> The gene *IGKC1*, responsible for the principal immunoglobulin light chain,<sup>[74]</sup> shows high [amino acid](#) divergence between domesticated types and [ferals](#) derived from them. This divergence can be as high as 40%,<sup>[73]</sup> and

indicates high genetic diversity of populations surviving over evolutionary time scales.<sup>[74]</sup>

## Human relationships with rabbits

Recent research has shown that all European rabbits carry common genetic markers and descend from one of two maternal lines. These lines originated between 12,000 and 6.5 million years ago when glaciers isolated two herds, one on the [Iberian Peninsula](#) and the other in [Southern France](#). Humans likely began hunting rabbits as a food source, but further research is needed to verify this. Little comprehensive evidence of the relationship of humans with European rabbits is documented until the medieval period.<sup>[75]</sup>

Humans' relationship with the European rabbit was first recorded by the Phoenicians prior to 1000 [BC](#), when they termed the Iberian Peninsula *i-Shaphan-ím* (literally, the land of the [hyraxes](#)). This phrase closely resembles related [modern Hebrew](#): *I* (אִי) meaning island and *shafan* (שָׁפָן) meaning hyrax, plural *shfaním* (שָׁפָנִים). Phoenicians called the local rabbits 'hyraxes' because rabbits resemble hyraxes in some ways, and hyraxes are native to [Phoenicia](#), unlike rabbits. Hyraxes, like rabbits, are not rodents. One theory states that the Romans converted the phrase *i-Shaphan-ím*, with influence from the Greek *Spania*, to its Latin form, [Hispania](#), which evolved in all the Iberian languages - into Castilian *España*, Portuguese *Espanha*, Catalan *Espanya* (English "Spain"), and such other variations in modern languages. Different views have been voiced on the precise meaning of *shafan*, but the balance of opinion appears to indicate that the hyrax is indeed the intended meaning.<sup>[76]</sup>

Like the Phoenicians, neither the later [Greek](#) nor [Roman](#) colonizers had a specific name for the rabbit, because the species is not native to [Greece](#) and [Italy](#) (though it is present there nowadays). They commonly called it "small hare" and "small digging hare", in contrast to the [European hare](#), which is larger and does not make burrows.<sup>[77]</sup> [Catullus](#) used the name *cuniculus* (a latinization of the Western [Iberian](#) word κόνικλος<sup>[8]</sup> and the etymological origin of the Castilian name *conejo*, Portuguese *coelho* and Catalan *conill*,<sup>[78]</sup> and the English name *coney*<sup>[79]</sup>), and referenced its abundance in [Celtiberia](#) by calling this region *cuniculosa*, i.e. rabbit-ridden.<sup>[8][80][81]</sup>

The European rabbit is the only rabbit species that has been domesticated and all [305 global rabbit breeds](#)— from [Netherland Dwarf](#) to [Flemish Giant](#)— are descendants of the European rabbit. Rabbits are an example of an animal that can be treated as a food, a pet, or a pest by different members of the same culture. In some urban areas, infestations of feral European rabbits (descended from pets) have become a problem. [Helsinki](#), for example, host to one of the northernmost [populations of the species](#), had an estimated 2,500 European rabbits at the end of 2006, doubling to 5,000 by autumn 2007.<sup>[82]</sup>

# As an introduced species

The European rabbit has been introduced as an [exotic species](#) into several environments, often with harmful results to vegetation and local wildlife, making it an [invasive species](#). The first known mention of the rabbit as an invasive species (and possibly the first documented instance of an invasive species ever) was made in regard to the introduction of the rabbit to the [Balearic Islands](#) after the [Roman conquest](#) of the first century BCE. According to both [Strabo](#) and [Pliny the Elder](#), the multiplying rabbits caused famines by destroying crop yields and even collapsed trees and houses with their burrowing. The inhabitants petitioned [Augustus](#) for help, who sent troops to curb the rabbit population with the help of [ferrets](#).<sup>[77][81]</sup>

Other locations where the European rabbit was introduced include [Great Britain](#);<sup>[85]</sup> two of the Hawaiian Islands ([Laysan Island](#) and [Lisianski Island](#));<sup>[86]</sup> Oceania's [Macquarie Island](#);<sup>[87]</sup> the island [Ōkunoshima](#) in Japan;<sup>[84]</sup> Washington's [Smith Island](#) and [San Juan Island](#) (around 1900 and later spreading to the other San Juan Islands);<sup>[citation needed]</sup> several islands off the coast of [Southern Africa](#) (including [Robben Island](#));<sup>[citation needed]</sup> and [Australia](#)<sup>[88]</sup> and [New Zealand](#).<sup>[89][90]</sup> The two accounts over the introduction of rabbits in [Ukraine](#) are conflicting. One holds that the species was brought there in the early 20th century by [Austrian nobleman Graf Malokhovsky](#), who released them on his estate near the [Khadzhibey Estuary](#), while another holds that rabbits were first brought to [Kherson](#) from [Switzerland](#) in 1894–1895 by landowner Pinkovsky.<sup>[91]</sup>

## In the British Isles

[\[edit\]](#)

The European rabbit is widespread in Great Britain, [Ireland](#), and most other islands, except for [Isles of Scilly](#), [Rùm](#), [Tiree](#), and some small Scottish islands, such as [Gunna](#), [Sanday](#), and most of the [Treshnish Isles](#).<sup>[92]</sup> It was likely first brought to Britain by the [Normans](#) after the [1066 conquest of England](#), as no pre-Norman British allusions to the animal have been found. The rabbit was nonetheless scarce or absent throughout most of England a short time afterwards, as warrens are not mentioned in the [Domesday Book](#) or any other 11th-century documents. Rabbits became well known, but not necessarily accepted members of British fauna between the 12th and 13th centuries. The first real evidence of their presence is a number of bones from the [midden](#) of [Rayleigh Castle](#), which was occupied from the 11th–13th centuries. The first references to rabbits in Ireland occur roughly at the same time as English ones, thus indicating another Norman introduction. They had become plentiful, probably at a local level, by the 13th century, as indicated by an inquisition of [Lundy Island](#) made in 1274 describing how 2,000 rabbits were caught annually. Subsequent allusions in official documents became more frequent, with the species later becoming

an important food item at feasts.<sup>[93]</sup>

Truly wild populations increased slowly, primarily in the coastal areas and lowland heaths of [Breckland](#) and [Norfolk](#). There were notable population increases after 1750, when changes in agricultural practices created favourable habitats, and increasing interest in game management resulted in intensive predator control campaigns.<sup>[54]</sup> Although now common in the Scottish lowlands, the species was little known in Scotland before the 19th century. Until then, it was confined to portions of the [Edinburgh](#) district at least as far back as the 16th century, certain islands and the coastal [sand dunes](#) of the Scottish mainland. Although unknown in [Caithness](#) in 1743, the species became well established there by 1793.<sup>[93]</sup>

[Myxomatosis](#) entered Britain from France in 1953, and reached Ireland by 1954,<sup>[70]</sup> prompting the [RSPB](#) to set up "mercy squads" meant to euthanise myxomatous rabbits.<sup>[94]</sup> Major myxomatosis outbreaks still occur in Britain, peaking twice annually: in spring and especially in late summer or autumn, though [immunity](#) has reduced the [mortality rate](#) from 99% to 5–33%.<sup>[70]</sup>

Between 1996 and 2018, rabbit numbers fell by 88% in the east Midlands of England, 83% in Scotland, and 43% across the whole of the UK. Numbers are still falling (in 2021). Pip Mountjoy, Shifting Sands project manager at [Natural England](#), said: "They (rabbits) are actually an endangered species in their native region on the Iberian peninsula. It is surprising for people that rabbits are important in some ecosystems. We think of them as a pest but in Britain they are a keystone species – they act as landscape managers and a lot of other species rely on them." The Shifting Sands project aims to encourage landowners to create safe habitats for rabbits, consisting of piles of branches placed near existing rabbit warrens. Species that depend on rabbits' grazing habits include [purple milk vetch](#), [rare spring sedge](#), [spring speedwell](#), prostrate perennial [knawel](#), caterpillars of the lunar yellow underwing moth, stone curlew, and the [large blue butterfly](#).<sup>[95]</sup>

## In Australia

[\[edit\]](#)

Main article: [Rabbits in Australia](#)

[220px-Wild\\_rabbit\\_in\\_grass.jpg](#)

A feral rabbit on a farm in [Victoria](#), Australia

Though rabbits were first introduced to Australia in 1788 with the arrival of the [First Fleet](#),<sup>[96]</sup> the most significant population explosion occurred later on in the 19th century. Twenty-four specimens of the European rabbit were introduced to Australia in 1859 by estate owner [Thomas Austin](#) in [Victoria](#).<sup>[97]</sup> Their descendants multiplied and spread throughout the country and caused severe agricultural damage and widespread ecological changes that contributed to the decline of native Australian species such as the [greater bilby](#) (*Macrotis lagotis*) and the [southern pig-footed bandicoot](#)

(*Chaeropus ecaudatus*).<sup>[98]</sup>

Between 1901 and 1907, Australia built an immense "[rabbit-proof fence](#)" to halt the westward expansion of the infestation.<sup>[97]</sup> The European rabbit, however, can not only jump very high, but also burrow underground,<sup>[99]</sup> and this fence failed to protect from rabbit infestation;<sup>[100]</sup> despite this, further fencing projects were undertaken that also failed to control the spread of rabbits in Australia.<sup>[101]</sup>

During the 1950s, the intentional introduction of a virus that causes myxomatosis provided some relief in Australia,<sup>[102]</sup> but not in New Zealand, where the insect [vectors](#) necessary for the spread of the disease were not present.<sup>[103]</sup> Myxomatosis can also infect pet rabbits (the same species). Today's remaining feral rabbits in Australia are largely immune to myxomatosis. A strain of a second deadly rabbit virus, [rabbit hemorrhagic disease](#) (RHD), was imported to Australia in 1991 as a [biological control](#) agent, and was released accidentally in 1995, killing millions of rabbits.<sup>[104][105]</sup> The virus has been developed further to address changes in environment and population.<sup>[106]</sup> RHD was also introduced—illegally—in New Zealand with less success due to improper timing.<sup>[107]</sup>

## In Chile

[\[edit\]](#)

The exact date on which the European rabbit was introduced into [Chile](#) is unknown, though the first references to it occur during the mid-18th century. By the 19th century, several authors referred to the presence of both rabbits and rabbit hutches in central Chile. The importation and breeding of rabbits was encouraged by the state, as rabbits were seen as cheap sources of food for peasants. Whether or not their escape into the wild was intentional is unknown, but warnings over the dangers of feral rabbits were raised during the early 20th century, and the species had propagated dramatically by the late 1920s in central Chile, [Tierra del Fuego](#), and the [Juan Fernández Islands](#). In the 1930s, the state sought to tackle the rabbit problem by banning fox hunting, though it was later discovered that indigenous [South American foxes](#) rarely preyed on rabbits, preferring native species. In modern times, the European rabbit problem has not been resolved definitively, though a deliberate outbreak of myxomatosis in Tierra del Fuego successfully reduced local rabbit populations. The species remains a problem in central Chile and on Juan Fernández, despite international financing.<sup>[108]</sup>

## Domestication

The European rabbit is the only rabbit to be widely [domesticated](#),<sup>[99]</sup> for meat, fur, wool,<sup>[109]</sup> or as a [pet](#).<sup>[110]</sup> It was first widely kept in [ancient Rome](#) from the first century BC, where [Pliny the Elder](#) described the use of rabbit [hutches](#), along with enclosures called *leporaria*.<sup>[111]</sup> The European rabbit has been refined into a [wide variety of breeds](#)<sup>[112]</sup> during and since the emergence of [animal](#)

[fancy](#) in the 19th century.<sup>[113]</sup>

[Selective breeding](#) has been used since ancient times in efforts to raise rabbits with different characteristics, and while domestic rabbits are typically larger than wild rabbits,<sup>[114]</sup> the various breeds of domestic rabbit exist in a range of sizes from "dwarf" to "giant".<sup>[115]</sup> They have as much color variation among themselves as other livestock and pet animals.<sup>[116]</sup> Their fur is prized for its softness; the large [Angora rabbit](#) breeds are raised<sup>[117]</sup> for their long, soft fur, which is often spun into yarn.<sup>[118]</sup> Other breeds are raised for the fur industry, particularly the [Rex](#), which has a smooth, [velvet](#)-like coat.<sup>[117]</sup>

## Meat and fur

In the United Kingdom, rabbit was a popular food source for the poorer classes. Among wild rabbits, those native to Spain were reputed to have the highest meat quality, followed by those in the [Ardennes](#). As rabbits hold very little fat, they were hardly ever roasted, being instead boiled, fried, or stewed.<sup>[119]</sup>

The pelt of the rabbit is heavier and more durable than the hare's.<sup>[120]</sup> [Marshall](#) calculated that the value of the skin in proportion to the carcass was greater than that of the [sheep](#) and [ox](#).<sup>[121]</sup> Its fur is primarily used for [felt](#)ing or [hats](#). It is also dyed or clipped, and sold as imitations of more valuable furbearers, such as [fur seal](#). Although cheap and easily acquired, rabbit fur has little durability.<sup>[122]</sup>

## Conservation status

Though the European rabbit thrives in many of the locations where it was introduced, in its native Iberia, populations are dwindling. In 2005, the Portuguese [Institute for Nature Conservation and Forests](#) classified *O. cuniculus* in Portugal as "near threatened",<sup>[123]</sup> while in 2006, Spanish authorities (SECEM) reclassified it in Spain as "vulnerable".<sup>[124]</sup> In 2018, the [International Union for Conservation of Nature](#) reclassified *O. cuniculus* in Spain, Portugal, and France as "endangered", due to the extent of recent declines. The [IUCN](#) assessment of the species considers only those populations within its natural distribution,<sup>[125]</sup> and as such it is considered [endangered](#) by that group.<sup>[3]</sup>

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