

# A LOOK AT RABBITS WORLDWIDE

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**HANNAH M BOSE** BVMS, MRCVS details rabbit genera found globally and distinctive traits compared with their domestic counterparts

## Summary

Domestic rabbits belong to the same species, but 10 different genera of rabbits exist worldwide. The European rabbit, *Oryctolagus cuniculus*, has two subspecies and all domestic rabbits are descended from *O cuniculus cuniculus*. The European rabbit is susceptible to three diseases of great importance – myxomatosis, rabbit haemorrhagic disease and encephalitozoonosis – while the other rabbit genera differ in their susceptibilities to these diseases.

Cottontails are the natural host of the myxoma virus and rarely suffer with infection; the pygmy rabbit is a specialist feeder, able to detoxify sagebrush; and the volcano rabbit is the second smallest leporid, larger only than the pygmy rabbit. The bristly, striped and Amami rabbits are native to Asia, while the riverine, Bunyoro and rock rabbits are African. Special mention is made of the endangered status of the various species and conservation efforts.

## Key words

***Oryctolagus*, Lagomorpha, taxonomy, rabbit, conservation**

**IN the UK, at least, our understanding of the rabbit is the wild (European) rabbit and the various breeds of domestic rabbit; however, there is a far greater diversity encompassed in the name.**

The European rabbit and pet rabbits belong to the *Oryctolagus cuniculus* species, but other rabbits exist worldwide that are sufficiently distinct to belong to different genera entirely. Thus, the greatest variety of rabbits in taxonomic terms can be found not between breeds of the same species, nor species within a genus, but between genera.

In fact, 10 genera of rabbits exist: *Brachylagus* (pygmy); *Bunolagus* (riverine); *Caprolagus* (bristly); *Nesolagus* (striped); *Oryctolagus* (European); *Pentalagus* (Amami); *Poelagus* (Bunyoro); *Pronolagus* (rock); *Romerolagus* (volcano); and *Sylvilagus* (cottontails). These genera, together with the genus *Lepus* (hares and jackrabbits), comprise the family Leporidae. In turn, Leporidae belong to the order Lagomorpha with the pikas (family Ochotonidae), the latter being small mammals, almost resembling guinea pigs in their appearance ([Figure 1](#)).

Rabbits belong to a different order compared to rodents (order Rodentia), with the common term for both being “glires” – a superorder (Douzery and Huchon, 2004). The Leporidae family displays differences in size, morphology, coat colour, disease susceptibility, diet and endangered status. Special mention is made here of conservation efforts.

## Europe

### ***Oryctolagus cuniculus***

The European rabbit, *Oryctolagus cuniculus* ([Figure 2](#)), is the only species in its genus, so is “monotypic”, in common with six other rabbit genera ([Table 1](#)). However, two subspecies exist: *O cuniculus cuniculus* – found throughout most of Europe and progenitor of the domestic breeds – and *O cuniculus algirus*, found only on the Iberian peninsula (Ferreira, 2012). *O cuniculus algirus* has also been known as *O cuniculus huxleyi* (World Lagomorph Society, personal communication) and is the smaller of the two subspecies (Gibb, 1990).

The wild European rabbit population is in decline, classified as “near threatened” according to the International Union for Conservation of Nature (IUCN) Red List. This is due to several factors including habitat loss, hunting and, most importantly, the viral diseases myxomatosis and rabbit haemorrhagic disease (RHD).

Myxomatosis is a common sight in wild European rabbits and has had devastating consequences on the population, with essentially 100 per cent mortality rate when first introduced. Co-evolution of both virus and European rabbit has reduced the mortality rate, but this still stands at 50 per cent to 90 per cent (Lumpkin and Seidensticker, 2011).

RHD virus (RHDV) has caused further losses to the European rabbit population. RHD was first found in China in 1984 and, so far, no other species of mammal other than the European rabbit has been shown to be fatally susceptible to it (Abrantes et al, 2012).

RHDV belongs to the Caliciviridae family and is transmitted both by direct contact and indirectly by fomites or blood-sucking insects. It is relatively resistant in the environment, where it has been shown to survive for up to three months. Infection is usually fatal and peracute or acute in presentation; it is possible for rabbits to suffer subacute or chronic infections, in which case they often survive with a protecting antibody seroconversion. The virus causes an acute necrotising hepatitis and disseminated intravascular coagulopathy.

*Encephalitozoon cuniculi* is a well-known pathogen of domestic rabbits, but not wild. There are only a handful of reports of the parasite infecting wild *O cuniculus* and of those the findings are of positive antibody titres and positive culture in asymptomatic, rather than clinically affected, individuals. One such report is from Australia (Thomas et al, 1997), which showed 20 out of 81 wild rabbits tested (25 per cent) had antibodies against *E cuniculi*; this was the first report of *E cuniculi* in wild rabbits in Australia. It is not unreasonable to suspect wild rabbits can suffer clinical disease with *E cuniculi* infection and there is certainly scope for further investigation in this area.

There has only been one report of *E cuniculi* infection in a lagomorph species other than the European rabbit. This study (Zanet et al, 2013) looked at the eastern cottontail (*Sylvilagus floridanus*) that had been introduced from the US to Italy and showed *E cuniculi* DNA in 14 out of 144 rabbits tested – a prevalence of 9.72 per cent. Furthermore, there has been one report of different *Encephalitozoon* species causing clinical disease in a different leporid species – *E intestinalis* and *E hellem* in the European hare, *Lepus europaeus*. The hare had lesions in its kidneys and tested positive for the two microsporidia (De Bosschere et al, 2007).

## The Americas

### *Sylvilagus*

The cottontails, *Sylvilagus* species, are a relatively wellknown genus and largely resemble the European rabbit in appearance (Gibb, 1990). Their habitat is the Americas (north, central and south) and southern parts of Canada. Compared to the other leporid genera, theirs has the greatest number of species ([Table 1](#)), with an addition to the number by the discovery of the Venezuelan lowland rabbit, *S varynaensis*, which was found to be a distinct species around the turn of the 21st century.

Cottontails have very different susceptibilities to the myxoma virus compared to the European rabbit. They have co-evolved with the virus such that it causes only a cutaneous fibroma at the site of insect bite, without systemic disease (Silvers et al, 2010; Spiesschaert et al, 2011). The exception to this is very young cottontails, which may suffer debilitating disease when infected (Silvers et al, 2010).

To be precise, the natural long-term host of the North American strain of myxoma virus is *S bachmani* (brush rabbit) and that of the South American strain is *S brasiliensis* (tapeti or jungle

rabbit; [Figure 3](#)). There has been introduction of the myxomatosis-resistant eastern cottontail (*S floridanus*) to France and Italy for the purpose of providing game for hunters, though the Lagomorph Specialist Group opposes this introduction (Myers, 1990; Zanet et al, 2013).

A number of cottontails are under threat ([Table 2](#)). The New England cottontail (*S transitionalis*) has attracted the attention of the US Fish and Wildlife Service as being a species in need of habitat protection (Fuller and Tur, 2012). It is classified as “vulnerable”, but the population is declining, according to the IUCN.

### ***Brachylagus idahoensis***

The smallest leporid is the pygmy rabbit (*Brachylagus idahoensis*), weighing an average of 400g to 500g (Dobler and Dixon, 1990; Shipley et al, 2006). Its habitat is western North America, in areas rich in the plant sagebrush (*Artemisia* species). The pygmy rabbit is a specialist feeder – a term applied to only approximately one per cent of mammals; it obtains up to 99 per cent of its diet from sagebrush in winter when other plant material is scarce (Shipley et al, 2006). To do this it has had to develop the ability to detoxify the plant secondary metabolites, such as monoterpenes, which otherwise causes sagebrush to be toxic. The pygmy rabbit has been shown to detoxify sagebrush to a greater extent than the sympatric *Sylvilagus* (Shipley et al, 2012).

The main area inhabited by the pygmy rabbit is the Great Basin, but there is a subpopulation in the Columbia Basin that is genetically distinct. These Columbia Basin pygmy rabbits ([Figure 4](#)) were on the verge of extinction before a breeding programme was set up and, as a result of the programme, captive-born rabbits were successfully released back into the wild. Three institutions were involved in this – Oregon Zoo, Northwest Trek Wildlife Park and Washington State University.

The wild population total had been so depleted in number, there were less than 20 individuals to use in the project and thus pygmy rabbits from outside the area were brought in for a degree of interbreeding. The project ended last year, after a productive decade of operation.

### ***Romerolagus diazi***

The volcano rabbit, *Romerolagus diazi*, is the second smallest rabbit species and native to Mexico. It has short ears and a dark brown fur coat, buff on the ventrum. They have been raised in captivity in Jersey Zoo and Chapultepec Zoo, Mexico (Durrell and Mallinson, 1970; Hoth and Granados, 1987). It is endangered and protected from international trade by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the latter status being shared with only one other lagomorph.

## **Asia**

### ***Pentalagus furnessi***

*Pentalagus furnessi* is a primitive darkly coloured rabbit found on two islands of Japan, from where it gets its common name, the Amami rabbit. It has a dark pelage, short ears and small eyes. It is endangered and has been declared a Japanese natural monument, giving it protected status. Among threats it faces are predation by the small Indian mongoose, dogs and cats, as well as habitat loss and fragmentation.

The small Indian mongoose, *Herpestes javanicus*, was intentionally introduced on to the Japanese islands to predate a pit viper – the habu, *Trimeresurus flavoviridis*, which has been known to cause human deaths (Yamada and Sugimura, 2004). There was a four-year long government-led project (1999 to 2003) to control the alien mongoose; on Amami Oshima island, 9,960 mongooses were captured, yet there is still scope to do this on a larger scale and thus protect the Amami rabbit further (Yamada and Sugimura, 2004).

## ***Nesolagus***

The striped rabbits, *Nesolagus*, are elusive and it has only recently been determined there are two species in the *Nesolagus* genus, rather than one. The Sumatran striped rabbit (*N netscheri*) has been known since the late 19th century, whereas the Annamite striped rabbit (*N timminsi*) was first described in 1996 (Can et al, 2001). In fact, this first recorded sighting was a dead rabbit in a meat market and so little is known about its population, the Annamite striped rabbit is classed as “data deficient” in the IUCN Red List. The Sumatran striped rabbit is classified as vulnerable on the IUCN Red List.

## ***Caprolagus hispidus***

*Caprolagus hispidus* is a very endangered species with an estimated population in only the hundreds (Aryal and Yadav, 2010). Its common names are hispid hare, bristly rabbit and Assam rabbit; bristly rabbit is the preferred name as it is a rabbit, but hispid hare seems to be the more commonly used name (Lumpkin and Seidensticker, 2011).

It is native to India, Bangladesh and Nepal, and is listed as endangered on the IUCN Red List and CITES. The major threat facing the bristly rabbit is habitat loss, especially the burning of the long grass it lives in; unfortunately, the grasses are often burned during the rabbit’s breeding season, which is in winter. There are efforts to educate the local population, including the advice given to burn in a rotational system, though burning is still permitted (Nath et al, 2010). Nevertheless, this is a starting point for conservation.

## **Africa**

### ***Bunolagus*, *Poelagus* and *Pronolagus***

The genera *Bunolagus* (riverine), *Poelagus* (Bunyoro) and *Pronolagus* (rock) can be grouped as

African rabbits. *Poelagus* and *Pronolagus* inhabit central and southern Africa respectively; *Bunolagus* has a very small range within South Africa (Duthie and Robinson, 1990). They have not yet been studied extensively.

The riverine rabbit can be recognised by the dark stripe running from mouth to ears (Duthie and Robinson, 1990). It is critically endangered ([Table 2](#)) and the Dryland Conservation Programme has been set up in Africa by the Endangered Wildlife Trust to conserve its habitat and study this species further. Appropriately, among the list of programme sponsors is chocolate rabbit manufacturer, Lindt. There is concern if the riverine rabbit was to be exposed to the myxoma virus, the disease could cause extinction of the species due to a similarity in immune system with the European rabbit (Lumpkin and Seidensticker, 2011).

## Conclusion

- 11 genera exist in the Leporidae family – 10 are rabbits.
- Two subspecies of European rabbit exist.
- The cottontails are the natural hosts of the myxoma virus.
- One species of cottontail has been introduced to Europe because of its resistance to myxomatosis.
- Many rabbit species are under threat.

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**Figure 1.** *Ochotona hyperborea* – a lagomorph, but not a leporid.



**Figure 2.** *Oryctolagus cuniculus*.

IMAGE: Wikimedia Commons/N p holmes.



**Figure 3.** *Sylvilagus brasiliensis*.

IMAGE: Wikimedia Commons/Bollux.





**Figure 4.** *Brachylagus idahoensis*.

IMAGE: © Oregon Zoo/Michael Durham.

Scientific name	Common name
<i>Brachylagus idahoensis</i>	Pygmy rabbit
<i>Bunolagus monticularis</i>	Riverine rabbit
<i>Caprolagus hispidus</i>	Bristly rabbit
<i>Lepus species</i>	Hares and jackrabbits
<i>Nesolagus netscheri</i>	Sumatran striped rabbit
<i>Nesolagus timminsi</i>	Annamite striped rabbit
<i>Oryctolagus cuniculus</i>	European rabbit
<i>Pentalagus furnessi</i>	Amami rabbit
<i>Poelagus marjorita</i>	Bunyoro rabbit
<i>Pronolagus crassicaudatus</i>	Natal red rock rabbit
<i>Pronolagus randensis</i>	Jameson's red rock rabbit
<i>Pronolagus rupestris</i>	Smith's red rock rabbit
<i>Pronolagus saundersiae</i>	Hewitt's red rock rabbit
<i>Romerolagus diazi</i>	Volcano rabbit
<i>Sylvilagus species</i>	Cottontails

Table 1. The leporids (Lumpkin and Seidensticker, 2011).

Scientific name	Common name	IUCN category
<i>Bunolagus monticularis</i>	Riverine rabbit	Critically endangered
<i>Caprolagus hispidus</i>	Bristly rabbit	Endangered
<i>Nesolagus netscheri</i>	Sumatran striped rabbit	Vulnerable
<i>Nesolagus timminsi</i>	Annamite striped rabbit	Data deficient
<i>Pentalagus furnessi</i>	Amami rabbit	Endangered
<i>Romerolagus diazi</i>	Volcano rabbit	Endangered
<i>Sylvilagus cognatus</i>	Manzano mountain cottontail	Data deficient
<i>Sylvilagus dicei</i>	Dice's cottontail	Data deficient
<i>Sylvilagus graysoni</i>	Tres Marias cottontail	Endangered
<i>Sylvilagus insonus</i>	Omilteme cottontail	Endangered
<i>Sylvilagus mansuetus</i>	San Jose brush rabbit	Critically endangered
<i>Sylvilagus robustus</i>	Robust cottontail	Endangered
<i>Sylvilagus transitionalis</i>	New England cottontail	Vulnerable
<i>Sylvilagus varynaensis</i>	Venezuelan lowland rabbit	Data deficient

**Table 2. Vulnerable, endangered, critically endangered rabbits according to the IUCN Red List and those with insufficient data to be classified.**