

CAPTIVE BREEDING AND REINTRODUCTION



THE RED SQUIRREL *SCIURUS VULGARIS*

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Captive Breeding of the Red Squirrel *Sciurus vulgaris*

Introduction

The red squirrel *Sciurus vulgaris* is the only squirrel native to Britain and is already extinct over most of England and Wales. It is estimated that Scotland supports three quarters of the 160,000 red squirrels thought to be living in Britain today.



The native British red squirrel

The grey squirrel, *Sciurus carolinensis*, was introduced to Great Britain in the late 19th century and has had a dramatic impact on the native red squirrel. Grey squirrels have out-competed red squirrels, which occupy a similar ecological niche. Grey squirrels have a competitive advantage as they are better adapted to living in broadleaved woodlands. At present therefore, red squirrel conservation efforts are focused on conifer forests.

Current Status

Historically, red squirrel populations have fluctuated widely, disappearing from some areas only to re-colonise at a later date. The red squirrel became extinct in Ireland and southern Scotland by the early 18th century. Dramatic decline over most of the last century has resulted in local extinctions over most of southern England, Northern Ireland and Wales.

The red squirrel is found across Europe and Asia. The only place where it is threatened is Britain. By 1990 three main populations still persisted in southern England; Poole Harbour in Dorset, Thetford in Norfolk and the Isle of Wight. The island of Anglesey in north Wales has seen a dramatic response in red squirrel

numbers to the removal of greys through trapping. The continued control of grey squirrels, together with red squirrel reintroduction, has seen an increase in numbers over recent years.



Red squirrel feeding

Legal Status

The red squirrel is protected under the following legislation:

- Schedules 5 and 6 of the Wildlife and Countryside Act (1981)
- Wild Mammals (Protection) Act 1996, which makes it illegal to subject them to any wilful act of cruelty or abuse
- Appendix III of the Bern Convention

In view of its more favourable conservation status in mainland Europe, the red squirrel is not listed on the EC 'Habitats' Directive (EC/92/43). It is listed on the IUCN Red List of Threatened Species, under the category of near threatened.

It is a UK Biodiversity Action Plan Priority Species and a Local Priority Species in over 25 counties in Britain.

Action Plan objectives involve:

- Maintaining and enhancing current populations of red squirrels where appropriate
- Re-establishing red squirrel populations where appropriate.

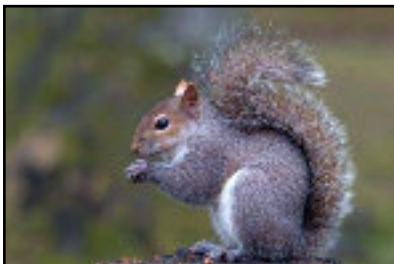


Reasons for Decline

Introduced Grey Squirrel

Red squirrels have been lost predominantly due to the spread of the grey squirrel, an introduced competitor from North America.

Grey squirrels carry parapoxvirus, which does not harm the greys but is fatal if contracted by reds, as there is no cure. Outbreaks can cause local extinctions of reds.



Introduced grey squirrel

Coccidiosis, a parasitic infection, affects both red and grey squirrels and contributed to a dramatic decline in numbers of both species in Britain between 1900 and 1925. Red squirrel numbers never recovered, unlike the greys.

Both species occupy similar ecological niches, relying on similar food sources. Reds lack the ability to digest large seeds from broadleaved woodlands. The grey squirrel (unlike the red) is able to digest acorns and feeds extensively on them. The nutritional value that greys obtain from this results in a competitive advantage over the reds. Different foraging habits of the two species mean that the red squirrel is more arboreal and specialised than the grey¹. The specialised nature of the red squirrel often results in weight loss and reduced breeding success. When the preferred food of the reds

has been eaten, greys can move on to new food sources which are unpalatable to reds.

Habitat fragmentation

Habitat fragmentation and habitat loss have the ability to make some areas less suitable for reds, further increasing their vulnerability to displacement by greys¹. Fragmentation is a disadvantage as the red squirrel is an arboreal feeder, therefore requiring a continuous tree canopy. In small isolated woodlands, sufficient food supply can only be provided in good years; seed crops are greatly reduced in some years posing a threat to survival².

Predation

Predation is equally likely upon red squirrels as it is for greys; however reds are more susceptible due to their reduced numbers. Natural predators include pine martens and birds of prey, although pine martens are found at such low densities this is unlikely to have an effect.

Road kills

Quite a number of red squirrels are killed as a result of road accidents, normally when the road runs through an area of woodland on both sides.



Unsuitable red squirrel habitat where clearfelling has occurred

General Ecology

Red squirrels are easily distinguished from their grey counterparts by their red-brown fur and distinctive ear tufts. Their head and body length is usually 18-24cm with a further 14-20cm for the tail. They are lighter than the grey squirrel, weighing from 250-350g. They show diurnal movements and do not hibernate, but may remain in their nests for several days during harsh winters. In the wild the maximum recorded lifespan is 6-7 years, but up to 10 years has been recorded in captivity. Red squirrels cache food during late summer and autumn for winter. Their diet consists of spruce and pine seeds as well as berries, fungi, bark and sap tissue. Very occasionally they have been known to eat vertebrates and eggs. Squirrels display very distinctive feeding signs; they split hazelnuts open leaving two pieces of shell with clean edges. Although red squirrels can inhabit mixed and broad leaved woodlands, they predominate in conifer plantations that are old enough to bear seeds and provide plenty of cover. Squirrels live in nests known as dreys; outer layers consist mainly of twigs and leaves while the inner cavity is lined with soft material such as moss, leaves and bark³. Red squirrels reach sexual maturity within 10 -12 months. Mating normally occurs between January and March, followed by a gestation period of 36-42 days. Litters consist of between 1-6 young (average 3) which are weaned at 7-10 weeks. Typically squirrels have one litter a year, but in optimum years there may be two.



Captive Breeding

Suitable Housing

It is believed that the most important dimension is height. Red squirrels have been successfully bred in small enclosures, provided these are



tall. This gives the illusion of security, allowing the squirrels to remain calm.

Internal design of a Wildwood red squirrel enclosure

At Wildwood, the enclosure itself is 7.5 x 3.7 x 3.7m with a safety porch of 1.3 x 1.3 x 2m. A tunnel runs at 1.9m off the ground from the enclosure to a feeding area at the end where dry food is provided. This is 7.1m x 28cm x 39cm which widens at the feeding area to 95cm x 65cm x 53cm. The feeding platforms are on a slight angle to allow drainage during heavy rain.



Food within the feeding stations



Tunnel to the feeding station as seen from within the enclosure

The enclosure and the tunnel have a 1.6cm² mesh size. Three nest boxes are provided high off the ground to simulate wild conditions where squirrels would make their dreys high in trees. Inside the enclosure, naturally fruiting trees and shrubs of species which the squirrels naturally feed upon should be planted. Log piles, branch piles and swinging feeders are all important for behavioural enrichment.



Feeding station and tunnel joined to the enclosure

Breeding

Wildwood has two pairs of squirrels which breed each year, producing offspring for release to Anglesey in Wales. Each pair is kept within the same enclosure all year round. Offspring are usually observed emerging from their nest boxes in April and are removed from the enclosure for reintroduction in June. On some occasions more than one litter has been produced by both pairs of squirrels in a season. Although nest boxes are provided for breeding, dreys have been built and used for nesting within the feeding tunnel. Offspring used for release into the wild should reach sexual maturity and be able to breed themselves within a year.



Reintroductions

Food allocation

Red squirrels are fed on the same diet all year round. Dry food consists of a mixture of equal parts of wild bird seed, parrot mix, hamster mix and mixed nuts. Bowls of dry food are placed on feeding platforms at the end of the tunnel. Fresh fruit and vegetables are supplied daily, usually consisting of apple, carrot or melon. These are suspended from branches within the enclosure; squirrels are extremely agile climbers and this helps to encourage foraging. Seasonal items such as hazelnuts, pine cones and tree flowers are also supplied when



Food suspended from branches within the enclosure

available. Fresh water in bowls is provided on a daily basis. Cuttlefish or deer antlers are available at all times as a good source of calcium. Commercial peanuts are limited as they inhibit the squirrels' uptake of calcium.

Suitable sites

Reintroductions should take place within areas that were once part of the red squirrel's geographic range but from which it has now become extinct. In the short term, forests should be managed in such a way as to increase red squirrel range and numbers, whilst at the same time discouraging the presence of greys⁴.

Large areas of mainly coniferous forest are required, as greys can make extensive foraging movements. A buffer zone to greys should be up to 3km wide, composed of habitats which are unsuitable for greys. Ideally about two-thirds of the red squirrel management area should be of seed-producing

age⁴. Food hoppers can be integrated into reintroductions. These are designed to tip out the heavier greys but allow the lighter red squirrels to feed⁵. Volunteers must be available to top up food on a regular basis. Woodland management and habitat improvement are more successful in larger areas over 200 hectares. Conifer woodland offers the ideal habitat for red squirrel conservation. Older plantations however, especially those dominated by Sitka spruce, only support low densities of red squirrels. To reduce the impact of poor cone years for a specific species, a variety of tree species is important. A range of age structure is also important. Management must be kept to a minimum; if felling does occur, it should be maintained within small areas and disturbance should be minimised during the breeding season. Anglesey in Wales is a good release site where protection has been achieved to date by strategic trapping of grey squirrels and habitat enhancement projects.

Health screening

A pre-release health screening protocol is necessary and should be carried out prior to release as an IUCN recommendation. Screening of animals before they are transferred for release will reduce the possibility of introducing undesirable disease-causing agents into already established red squirrel populations. The general condition of the individuals should be observed in detail, paying particular attention to the state of the coat, skin, external genitalia, eyes, ears, nose, feet, legs and teeth. Translocations and establishment of animals into a new geographical region, often through human involvement, must not introduce novel pathogens to the native fauna.

Health screening of closely related species in the reintroduction area should also be carried out. The two main diseases seen in red squirrels are coccidiosis and parapoxvirus. Both should be screened for prior to release as they have caused dramatic decline in numbers. Grey squirrels should be eliminated almost completely from the area as they carry the parapoxvirus.



Preparation of Sites and Soft Releases

All releases for red squirrels should be 'soft'. The animals are held in soft release pens for a minimum of a month at the release site.

Individuals should then have the chance to return to the pens for food, sleep or security reasons as necessary. Supplementary food should be provided but not every day. This allows the squirrels to learn about the unreliability of food supply in the wild.

Red squirrels must be introduced to as many food sources as possible prior to release or during a soft release as they find it difficult to adapt to new items of food. Several pairs of captive bred adults are placed within large enclosures located within the woodland at Anglesey. When they eventually breed and the offspring are weaned they will then be allowed to move out of the cages into the surrounding



Red squirrel feeding in the wild

habitat. Nest boxes are provided in the woodland and these are specially adapted, so that the entrance hole is small enough to allow entry to reds but not greys.

During the past three years, grey squirrels have almost been eradicated from a large coniferous plantation on Anglesey. Over 6,000 grey squirrels have been removed from the island at present, allowing reintroduced red squirrels to re-colonise the area. Research has shown that the original red squirrel population on Anglesey (before reintroduction) has lost a significant amount of genetic variability. The

remnant population now contains individuals that are all closely related, which could lead to future problems caused by inbreeding, hence the need for reintroduction to increase genetic diversity⁶.

Monitoring

A practice note has been produced by the Forestry Commission on the potential methods for monitoring squirrels, including sightings, transects, drey counts, cone counts, hair tubes and mark-recapture⁷. These methods all come with problems; either the sample sizes are too small or there is a difficulty differentiating between grey and red squirrels.

On Anglesey, nest boxes have been used to monitor the wild red squirrel population, yielding vital data on litter sizes and birth dates⁶. To determine whether a red or grey squirrel has entered a nest box, a strip of double sided tape is placed just inside the entrance hole. This catches hair as the squirrel brushes against it. When first erected, nest boxes are filled with hay which is used as nest material and the type of nest produced can determine the inhabitant.

The Highland Red Squirrel Group monitor using transects as opposed to nest box checks. This involves measuring out 100m transects in suitable habitat areas. The surveyor walks the 100m in 5 minutes as silently as possible, scanning both sides for squirrels and listening for squirrel sounds. He then stops for 5 minutes. If a squirrel is observed, the following must be noted; squirrel species, tree species the squirrel was observed in, perpendicular distance from the transect line and activity⁸. Any sightings of red squirrels should also be submitted to the relevant organisation in your area.

References

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