

## Book Review

**Book Review: “The Eurasian Red Squirrel: *Sciurus vulgaris*” by Stefan Bosch and Peter Lurz**

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When I had Bosch and Lurz’s book “The Eurasian Red Squirrel: *Sciurus vulgaris*” (2012) in my hands, I thought: at last! This is the English edition of the German book ‘Das Eichhörnchen: *Sciurus vulgaris*’. I got the opportunity to see the German version of the book during a congress and it seemed to me a great book, but the judgment was based only on the assessment of the topics covered, the extensive literature used as reference, the iconography included and the knowledge that Peter Lurz is a leading squirrel expert in Europe. The language barrier prevented me from reading. Now, with the English edition I could read and better evaluate the book. I must say that the two authors have done a great job. This book will be a reference for everyone interested in the European red squirrel, its biology and ecology, management and conservation. I still have in my library the book ‘Squirrels’ written by John Gurnell (1987). The book has been out of print for years. I was lucky enough to find one of the last copies in a bookshop in London. Gurnell’s book was my reference for any question regarding squirrels for many years, but now it is definitely outdated. Since its edition in 1987, 25 years have passed and our knowledge on the biology and ecology of the red squirrel has increased dramatically. It is time for a new reference and the book by Bosch and Lurz worthily fills this need. Peter Lurz co-authored a lot of research and papers with John Gurnell and his book a quarter-century after the previous one by Gurnell is like a handover.

The book is a mine of information on every aspect of the red squirrel’s natural history, but it

also goes in depth in the management and conservation problem of this species. The two hundred pages are enriched by 81 illustrations and 14 tables. The pictures are never glamorous, the authors do not seek to strike the reader with their beauty as in many other books, the photos are used to describe the fine details of the animals, their behaviour and the environment in which they live. The book is based on a deep knowledge of the species and the ongoing research throughout Europe. The twenty-two pages of references contain most of the papers ever produced on the red squirrel and related topics. This makes the book an invaluable source of information for students and researchers, but also for senior scientists that will find some unknown aspects of this species. At the same time, the writing style makes the book pleasantly readable by amateurs interested in this surprising species.

Peter is a friend, now you know! Thus, when I accepted to prepare this review, I imposed myself to find some limits of the book to highlight; just not to prepare a review that might be seen as too friendly. So here they are. Figure 32 could have been better prepared, avoiding the standard proposed by Excel for charts. Figure 56 would have benefited from more marked points and lines. The photos are excellent, they show many behaviours difficult to document; however the beauty of the book would have been enhanced by the addition of some drawings or sketches.

The readers of *Management of Biological Invasions*, would consider the chapter ‘Squirrels in the wrong place’ a must to read. It regards the

introduction of the American Eastern grey squirrel (*Sciurus carolinensis*) into Great Britain, Ireland and Italy. The rapid increase of the grey squirrel's distribution range, coincided with a dramatic decline of the range of the red squirrel, and the American species has now replaced the native squirrel over much of its range in these countries. The history of introductions, spread, management attempts and forecasting the future through the use of computer modelling, are synthesized in this chapter. Jumping to chapter 6.8 and 6.9 we learn how the American species is outcompeting the red squirrel. Interspecific competition occurs mainly for food resources and causes reduced body growth and lower juvenile recruitment and reproductive success in the red squirrel, leading to a decline in population densities and local extinction. However, competitive exclusion between these two species is also mediated by a squirrel poxvirus: grey squirrels act as a vector of the virus which causes a lethal disease in red squirrels. Chapter 7 on 'Threats and conservation' reviews the legal status of this species in many European countries and describes in detail the conservation strategy in the UK. Here the species is at the brink of extinction and forest management for red squirrels have a long history.

The other chapters deal with all the aspects of the red squirrel's natural history. The first is devoted to the taxonomy and the evolutionary history, from Rodents to Sciuridae (squirrels) and the red squirrel: the only European tree squirrel. Chapter two, in addition to the introduction of the gray squirrel, describes the huge distribution of the red squirrel and its presently recognized subspecies: from the Atlantic coast of Portugal and Ireland, across the whole Eurasia to China, Korea and Hokkaido island in Japan. The next chapter is dedicated to 'body form and function', with 28 subchapters that analyze in detail every aspect of the organs and their function. It starts with the skeleton, continuing with describing how squirrels can use limbs and tail for their movement on the ground and jump on trees, the composition and structure of the coat, with different figures that shows the extreme coat colour variation, and then sensory organs, hormone, digestion and energetic. Chapter four is an introduction to reproduction and development. All the different phases are considered: from the mating system to gestation and maternal care, development and survival. We learn that squirrels are solitary animals, with an intra-sexual territoriality. Adults usually do not

defend the part of the forest they are using, but adult females that reproduce defend the portion of land that they use more intensively from the access of other reproductive females. Other aspects of the red squirrel's behaviour are the core of the next chapter. The diet is described in detail, with a review of many studies from different parts of Eurasia. The red squirrel is a rodent with a broad diet. It could eat: seeds, buds, fungi, insects and other resources; however, tree seeds are the most important resource. One of the subchapters discusses the caching behavior, described as the 'art of hoarding, hiding and retrieving food'. Red squirrels do not hibernate, so the animals have to hoard food, mainly tree seeds, for winter. Body condition, winter survival, and the reproductive success of squirrels are correlated with the yearly seed crop of the forest and the cached seeds. But squirrels do not only use the forest to live and eat, they also help the forest in its renewal process. In years of high seed production, part of the hidden seeds will not be recovered by squirrels in winter and spring. The seeds left in the ground will have the chance to germinate and give rise to new plants. Red squirrels also look for mushrooms, including those underground, such as truffles and similar species. By dispersing the spores of fungi, the squirrel helps their growth. This action is very important because fungi are essential for the growth of many plants. The description of these complex relationships between squirrels, seeds, fungi and forests is a perfect introduction to the ecology chapter. Red squirrels are forest dwellers and habitat quality is measured in terms of forest composition, structure and connectivity. In the first part of this chapter the effects of landscape connectivity on population survival and genetic diversity are described. The second part is called red squirrels in 'space and time' and presents an updated picture of population dynamics, densities and interaction with other species. Red squirrels are preys, of goshawks and martens for instance, but also seed predators and dispersers, and the possible host of a variety of parasites and diseases. I have already described chapter seven devoted to the threats and conservation needs, mainly related to the negative interaction with the grey squirrel. The eighth chapter is on methods and research. The readers will see how traps, hair-tubes, radio tracking, camera-traps and other devices are used by wildlife biologists and managers to collect the information on their population of interest. The

last chapter is on squirrels and people and concludes the description of this arboreal species that suffers from human-mediated habitat fragmentation and introduced species competition. Often we do not realize this negative impact that depends on our interest in forest exploitation and in moving animals to the wrong place. Nevertheless, the red squirrel has its positive role in ecosystems but also in human society, being a character used in mythology, arts, and in children's stories. The human contradictions!

## References

- Bosch S, Lurz PWW (2012) The Eurasian Red Squirrel: *Sciurus vulgaris*. Westarp Wissenschaften, NBB English Edition, 206 pp
- Gurnell J (1987) The Natural History of Squirrels. Christopher Helm, London, 201 pp

The Eurasian red squirrel (*Sciurus vulgaris*) has a wide range and inhabits various habitats, both primeval and human-transformed (i.e. city parks). Its diet consists of numerous items, including plants, fungi and animal matter. It can be considered a generalist species, but conifer and broadleaf seeds dominate its diet. The reasons for the decline in the red squirrel population can be attributed to many variables (Bosch and Lurz, 2012), and although an earlier report suggested disease introduced with the grey squirrel (Middleton, 1930), the connection between epidemic disease in red squirrels and the presence of the imported grey squirrels was debated throughout the 20th century (Edwards, 1962; Keymer, 1974; Vizoso, 1968).