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Short communication

The occurrence of roof rats (*Rattus rattus* L., 1758) in Germany during the late 20th century

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Roof rats (*Rattus rattus* Linné, 1758) have been existant in the area covered by present-day Germany for almost 2000 years. Excavations revealed remains dating back to the second century (Lüttschwager 1968), to the 3rd–5th century (Teichert 1985), and to the early middle ages (Reichstein 1974, 1987). Patterns of their distribution in Central Europe appear not to be linked to natural conditions, such as climate and vegetation, but rather to man-made conditions, which tend to change rapidly. Roof rats may suddenly be introduced by the transport of goods, and they may be extinguished locally when industrial sites are abandoned or farms are modernized (Becker 1978). Pest control operations frequently reduce their populations. The occurrence of roof rats is very dynamic and not characterized by distribution lines used to describe the distribution of endemic species.

Many sites where roof rats become abundant remain unknown to scientists because farmers and pest control operators do not identify the species, and faunistic research projects rarely focus on commensal mammals. Although the roof rat has been classified as "extinct or disappeared" during the 1990s in some federal states of Germany, such as Bayern, Nordrhein-Westfalen, Hessen, Baden-Württemberg, and Rheinland-Pfalz (Nowak et al. 1994), pest control operations targeted this rat in other states.

Roof rats are generally less susceptible than Norway rats (*Rattus norvegicus*) to anticoagulant rodenticides, which have been predominantly used to control commensal rodents during the last few decades. To some degree, they are resistant to warfarin (Endepols and Schuster 1991). Their control is also impeded by the fact that they use smaller home ranges than Norway rats (Telle 1966; Endepols et al. 1989). Incorrect identification of the species during control operations may have resulted in an underestimated abundance of roof rats.

To summarize all occurrences of roof rats in Germany, we collated those that we identified ourselves and those published by others. In addition, we included analyses of owl pellets, and information obtained from data bases from the Landeshygieneinstitut Sachsen-Anhalt (LHI) in Magdeburg and from Bayer Animal Health in Monheim. The data comprise occurrences of roof rats, which were detected by farmers, millers or pest control operators. Such reports were verified when animals were sighted or carcasses found by the authors, by staff of one

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of these institutes or by another hygiene institute. The database of the LHI predominantly contains data from the eastern states of the 1980s. During this time, the LHI advised all rat control programs in the former German Democratic Republic (GDR) and was responsible for the registration of rodenticides.

Most infestations were recorded on farms in Sachsen, Sachsen-Anhalt, and Brandenburg in the 1980s (ERFURT et al. 1986). On large pig farms in these federal states, roof rats established particularly large populations exceeding 10000 individuals (ENDEPOLS et al. 1989). Poor standards in the extensive animal production in the GDR, such as food spillage, hollow walls and penetrable roofs, supported successful reproduction, even during the cold winters in East Germany (ENDEPOLS 1992).

Simultaneously, roof rats were considered locally extinct in some large federal states

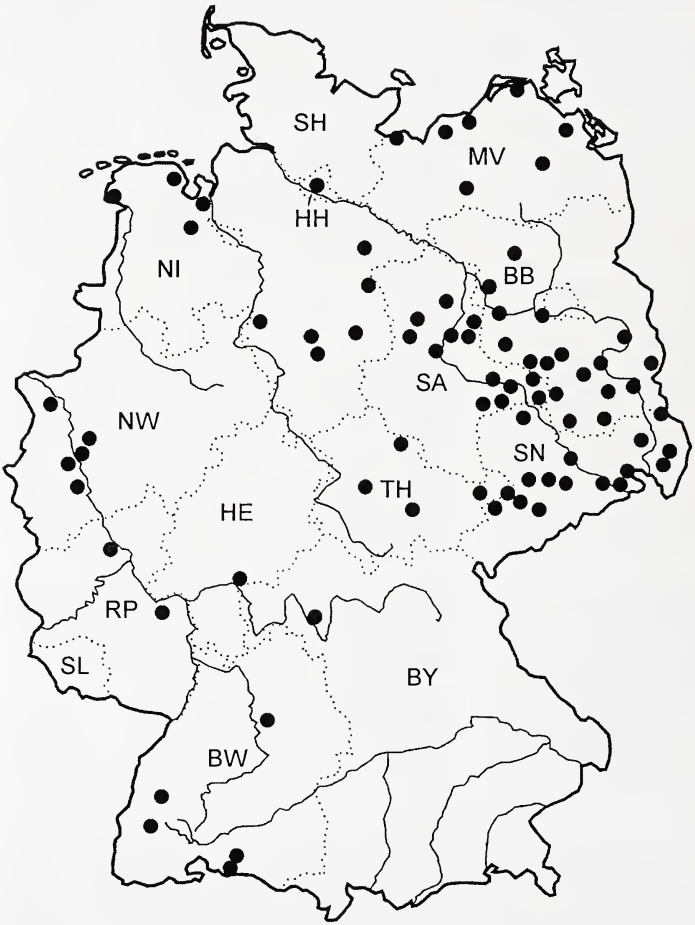

Fig. 1. Occurrences of roof rats (*R. rattus*) in Germany, 1980–1999. Each district where roof rats were recorded is marked by a dot. BB = Brandenburg, BW = Baden Württemberg, BY = Bayern (Bavaria), HE = Hessen (Hesse), HH = Hamburg, MV = Mecklenburg-Vorpommem, NI = Niedersachsen (Lower Saxony), NW = Nordrhein-Westfalen (North Rhine-Westphalia), RP = Rheinland-Pfalz (Rhineland-Palatinate), SA = Sachsen (Saxony), SH = Schleswig-Holstein, SL = Saarland, TH = Thüringen (Thuringia).

in western and southern Germany, such as Rheinland-Pfalz (Grünwald and Preuss 1983, 1987), Baden-Württemberg (Braun 1989), Nordrhein-Westfalen, Bayern, and Hessen (Nowak et al. 1994). Recently, roof rats were re-discovered in some of these areas.

Roof rats were detected in all but two small federal states, Schleswig-Holstein and Saarland, during the last 20 years (Fig. 1). Most populations in western Germany were detected in harbour areas along rivers. We found them in grain mills, food mills and silos along the river Main in the cities of Würzburg (1997) and Hanau (1995), and downstream of the Rhine River in cities, such as Cologne (1999), Düsseldorf (1996), Neuss and Wesel (1995). Roof rats were also detected in southwest Germany (Brünner and Troje 1991), at the Bodensee (lake of Constance) (Wilhelm, Braun, and Dieterlen, pers. comm.) and in the area of the middle Rhine (Dalbeck 1996).

In all regions, we observed the colour variations "rattus", "alexandrinus", and "frugivorus". In Hanau on the river Main and in Cologne on the Rhine River, we found pure populations of black rats. However, due to small sample sizes and specimens lacking fur, such as skulls and bones, characterization of a representative number of populations was not feasible. In general, the three variations of fur colour appear purely or in mixed populations in Germany.

Although large populations of roof rats appeared in habitats such as pig farms, grain mills and silos, light infestations were also detected on small farms, in restaurants and in small food-producing factories. Even in rural residential buildings a few roof rats were observed. Such infestations were reported solely where large rat populations were established nearby. Although many occurrences of roof rats probably remained unnoticed, our data support a previous evaluation that this species is not endangered in Germany (Boye et al. 1998). Conservation measures are neither necessary nor reasonable because roof rats represent a pest in the food industry and agriculture.

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