Small mammal communities in agricultural landscapes in Germany: review of field data over the last decade

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Abstract

Little is known about general composition of small mammal communities in agricultural land in Germany. Most published data represent only a few months' data in a specific habitat type focussing on a small region. This presentation will review data from several studies performed in the last decade of almost every year in agricultural land across different regions in Germany. Data on the distribution of small mammal species in landscapes dominated by agricultural land including cropped fields, meadows and adjacent field structures like hedgerows, woodland and field margins are presented. The data were collected during different investigations regarding diverse topics studied and are summarized for this presentation for the first time. The presented data may help to interpret the spatial and temporal composition and distribution of small mammal communities in agricultural landscapes.

Keywords: agricultural landscape, Germany, small mammals, species composition, species distribution,

Introduction

Published information about small mammal communities in agricultural landscapes in Germany is mostly restricted to a short time and a small spatial scale. Therefore, a large data set collected during different investigations spread over Germany is summarized. The presented data will show spatio-temporal patterns and distribution of small mammal communities in agricultural landscapes in Germany.

Materials and methods

The data set consists of 111 independent trapping grids distributed over 7 federal states in the years 2001-2010 (excluding the years 2004 and 2009). 11 of these trapping grids were especially designed for trapping of shrews and did not provide data of small rodent species. Trapping was mainly conducted with multi-capture live traps (Ugglan traps, Grahnab), which were partially adapted to the specific topics of some studies. The data set covers the months January-November. To get comparable values across all studies conducted, trapping efficiency (TE; captured ind./100 trap checks), was calculated. Trapping during all studies was performed in agricultural fields and adjacent off-crop habitats. For the presentation these data were assigned to the following habitat types: (1) agricultural field, (2) skirt of wood, (3) shrubbery (including hedge structures) and (4) grassland (including meadows, pastures and the ground plant cover in orchards).

More than a quarter of a million trap checks were conducted, >150,000 in agricultural fields, >60,000 in grassland and >40,000 in shrubbery and skirts of wood. The temporal scale of the data will be presented according to meteorological seasons.

Results

The trapping data revealed 18 different species found in agricultural landscapes. The habitat which contains most species was the skirt of wood (14 species), followed by agricultural fields (13 species) and shrubbery and grassland (9 species each). Thirteen species belonged to the order *Rodentia*, 4 to *Insectivora* and 1 to *Carnivora*. Considering mean TE, the four most abundant species were bank vole (*Myodes glareolus*, TE 14.2), yellow-necked mouse (*Apodemus flavicollis*, TE 10.6), common vole (*Microtus arvalis*, TE 6.7) and wood mouse (*A. sylvaticus*, TE 4.6). For further considerations and analysis only these species were evaluated, providing a sufficient data base.

In the skirt of woods, bank vole and yellow-necked mouse were the key species. At spring, bank voles, yellow-necked mice and also the wood mouse showed similar trapping efficiencies (6.7, 7.3 and 7.7 respectively). But in summer and autumn, bank vole (TE 38.2) and yellow-necked mouse (TE 25.8) were dominating in 'skirt of woods'.

The habitat category shrubbery with diverse microhabitats showed high numbers of bank voles (TE 15.5) and wood mice (TE 17.1) in spring, which changed in summer and autumn when bank vole (TE 27.1 and 21.9, respectively) yellow-necked mouse (TE 15.3 and 19.0, respectively) showed highest abundance.

Grassland habitats were dominated by the common vole. In autumn, also the other species were trapped but TEs were much lower.

In agricultural fields the trapping efficiency was about a tenth compared with the other habitats. The common vole and the wood mouse showed the highest trapping efficiency here. In agricultural field in spring the wood mouse had the highest TE and in summer, TE of the common vole (TE 3.0) was twice as high compared to the wood mouse (TE 1.3). In autumn, the numbers of common vole (TE 2.1) and wood mouse (TE 2.0) were nearly equal. The yellow-necked mouse and the bank vole showed their highest TE in summer in agricultural fields (TE 1.0 and 0.8, respectively).

The wood mouse population showed a decline in TE in summer in the habitats shrubbery and skirt of woods but an increase in agricultural fields. In grassland, the wood mouse was trapped in spring and summer only occasionally.

Considering the population dynamics (i.e. yearly maximum TE) common vole, bank vole, yellow-necked mouse and wood mouse followed the same general pattern. Furthermore, for the year 2005 TEs of the common vole of 3 distant regions were available, which show strong regional differences within the same season.

Discussion

Based on the data set, the small mammal community in agricultural landscapes in Germany was dominated by four rodent species. As expected, grassland habitats are dominated by common voles, and in agricultural field in spring the wood mouse had the highest TE and the second highest following the common vole in summer and autumn. The small mammal communities described are in concordance with data from the Czech Republic (Heroldova et al., 2007), where the dominating species in forest were the yellow-necked mouse and the bank vole. Also for ‘windbreaks’ Heroldova et al. (2007) showed the same species (yellow-necked mouse, wood mouse and bank vole) as in the similar habitat ‘shrubbery’ in our data set. The dominance of common voles and wood mice in agricultural habitats is confirmed by results of Heroldva et al. (2007) and Boye (2003), and our findings about small mammal communities reflect the species habitat preferences given e.g. in Braun and Dieterlen (2005). Interestingly, the populations of the wood mouse (i.e. TEs in ‘shrubbery’ and ‘skirt of woods’) declined in summer, whereas TE in agricultural habitats increased. This finding supports the hypothesis of Ouin et al. (2000) that dispersal towards crops could be the main factor explaining population drops in hedge like habitats. The yearly population development had the same tendency for the herbivorous common vole and the pronounced granivorous bank vole, wood mouse and yellow-necked mouse, as known from Flowerdew et al. (2004), Giraudoux et al. (1994), Flowerdew (1985), which have different habitat and food preferences. This might be an indication for species unspecific factors influencing the whole small rodent community. However, on the regional scale difference in yearly common vole abundance can be strong.

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