A Long-Term Survey of the Avifauna in an Urban Park

Michael Abs and Frank Bergen

Abstract Eight censuses of the breeding bird community in a 10 ha urban park in Dortmund, Germany, conducted over a time span of 43 years, revealed an increase in species number as well as in breeding density (territories/10 ha). We found a high species turnover rate of 42 % favouring generalist species and perhaps woodland species. Indicator species according to Flade (1994) are discussed. The ratio of the number of Blackbird *Turdus merula* territories to the number of Chaffinch *Fringilla coelebs* territories is used to describe the progress of urbanisation in breeding bird communities.

Keywords: urban habitat · breeding bird community · long-term trends · species turnover · urbanization.

1 Introduction

Long-term studies based on field observations of birds are urgently needed because they can provide the basis for statements with prognostic value. In this paper we discuss the development of the breeding bird community in an urban park over a period of 43 years. The study was carried out in Westpark, which covers an area of 10 ha and is situated 1.4 km from the city centre of Dortmund, Germany (51°30′ N; 7°28′ E). Founded in 1811 as a cemetery Westpark was transformed into a park after 1945. It is isolated from other green areas by extensive housing areas surrounding it. The tree vegetation is dominated by ash (26%) besides maple and birch, but oak, poplar, plane tree and horse chestnut also occur, whereas conifers are rare. The oldest trees are about 100 years of age. Since 1954 ground cover of the shrub layer changed very little from 18 % to 20 %. Regularly mown lawns cover the open spaces and much of the area under the trees. In the 1950s, 30 nestboxes were installed of which only one remained in 1997.

2 Material and Methods

The first five censuses were carried out by Erz (1956, 1964). Bergen (1996) monitored the breeding bird density in the 1990s using Oelke's (1974) methods. Between March and June ten visits took place in every study year. Data were analysed according to Hustings *et al.* (1989). In order

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to characterise the dynamic of the species composition we calculated the species turnover rate (T) using the slightly modified formula given by Mühlenberg (1993):

T = (J+E) $\times 100/(S_I + S_{II})$ with
J: number of additional species in season II
E: number of species that disappeared between season I and II
$S_I(S_{II})$: number of species found in season I (season II)

Statistical analysis was carried out using Mann-Whitney-U-Test.

3 Results and Discussion

The species number increased from 17 species (median) in the 1950s to 21 (median) in the 1990s. Breeding bird density also increased from 100 to 138 territories/10 ha. Both of these increases already occurred in the 1960s. The overall turnover rate of 42.1 % indicates that nearly half of the species in Westpark changed. Only ten species were found in all eight years of study (table 1). This is comparable with the turnover rate of the breeding bird community at a cemetery in Dortmund (Ostfriedhof) over a period of 35 years (T = 42.6 % according to Erz [1964] and Weiβ [1997]). For the avifauna of a cemetery at Lausanne, Switzerland, a turnover rate of 35.0 % was found over a period of 24 years (Ravussin & Mellina 1979). We calculated turnover rates of 25.0 % for birds in pine forests (according to data given by Dierschke 1973) and of 27.5 % for birds in deciduous forests (data from Tischler 1976). These turnover rates in nearly natural habitats may be related to succession as well as to ageing of the trees. In comparison with this, the higher turnover rates in urban parks like Westpark or cemeteries may be related to the long-lasting process of urbanisation of certain species.

Following the definition of dominance values given by Bick (1989; eudominant $> 10\%$), in the 1950s three eudominant species occupied about 50 % of all territories (Blackbird 20.2 %, House Sparrow *Passer domesticus* 16.6 % and Chaffinch 12.5 %). In the 1990s, however, only two eudominant species filled nearly 40.0 % of all territories (Blackbird 26.1 % and Wood Pigeon *Columba palumbus* 12.3 %) indicating a decline in species diversity. During the entire study period from 1954 to 1997 seven of the nine indicator species typical for the landscape type 'parks' (according to Flade 1994) occurred in Westpark. Five indicator species bred in Westpark in 1961, four in 1954 and 1962 and three in all other years of study. Only one indicator species, the Spotted Flycatcher *Muscicapa striata* was observed in all censuses (Table 1). Using Flade's equation for the indicator species-area relationship, four indicator species can be expected for an urban park of 10 ha. Furthermore, if we consider the total number of breeding species, Flade's equation leads to an expectation of 26 species instead of 21 which breed there now. In summary, the habitat and resources in Westpark seem to favour generalists. Species like Blackbird, Great Tit *Parus major* or Blue Tit *Parus caeruleus* profit from additional food provided by people. But for more specialised birds like Whitethroat *Sylvia communis* or Icterine Warbler *Hippolais icterina*, both disappeared after 1964, Westpark no longer seems to offer suitable breeding habitat. This may be due to the high rate of human disturbance. The immigration of the Nuthatch into Westpark after the 1960s and its first occurrence in a cemetery of Lausanne in 1965 (Ravussin & Mellina 1979) support the idea of an ongoing occupation of suboptimal habitats by this species (Gatter 1998).

In search for a measure for the ongoing process of urbanisation we took the ratio of Blackbird versus Chaffinch territories. These two species show no interspecific competition. We compare our data with those from urban parks of east-central European cities (Biadun 1994; Luniak 1981; Müllerova-Franekova & Kocian 1995) and from Bialowieza National Park (Tomialojc & Wesolowski 1990) as a natural woodland reference. Figure 1 shows that the ratio obtained in Westpark in early years is low, while values from the 1990s are significantly higher (U-Test; $p<0.005$). In two cemeteries in Dortmund and in Lausanne this ratio also grew from 2.2 in 1962 to 4.6 in 1996 (Weiβ 1997) and

Table 1 Numbers of species breeding in Westpark, Dortmund, breeding density (territories/10ha) and turnover rate (species which were observed at all years of study are printed in bold; indicator species are printed in italics)

	Territories / 10 ha		1954	1955	1956	1961	1962	1994	1995	1997
1	Woodpigeon	*Columba palumbus*	7.1	7.1	3.6	8.9	10.7	17.0	24.0	14.0
2	*Collared Dove*	*Streptopelia decaocto*	–	–	–	*3.6*	*5.4*	*1.0*	*2.0*	–
3	*Green Woodpecker*	*Picus viridis*	–	–	–	–	–	–	–	*1.0*
4	Great Spotted Woodpecker	*Picoides major*	–	–	–	–	–	–	–	1.0
5	Wren	*Troglodytes troglodytes*	–	–	–	–	1.8	3.5	7.0	4.0
6	Dunnock	*Prunella modularis*	1.8	1.8	3.6	3.6	3.6	4.0	7.5	4.5
7	Robin	*Erithacus rubecula*	–	–	–	1.8	1.8	3.0	3.0	2.0
8	*Redstart*	*Phoenicurus phoenicurus*	*5.4*	*5.4*	*5.4*	*5.4*	*5.4*	–	–	–
9	Blackbird	*Turdus merula*	17.8	21.4	21.4	25.0	23.2	43.0	41.5	30.0
10	Song Trush	*Turdus philomelos*	–	–	–	1.8	1.8	3.5	6.0	2.0
11	Mistle Trush	*Turdus viscivorus*	–	–	–	–	–	1.0	1.0	–
12	*Icterine Warbler*	*Hippolais icterina*	*1.8*	–	*1.8*	*3.6*	*3.6*	–	–	–
13	Whitethroat	*Sylvia communis*	1.8	1.8	1.8	1.8	1.8	–	–	–
14	Blackcap	*Sylvia atricapilla*	–	–	–	1.8	1.8	3.0	6.0	5.5
15	Chiffchaff	*Phylloscopus collybita*	3.6	3.6	5.4	5.4	5.4	3.0	6.5	7.0
16	Spotted Flycatcher	*Muscicapa striata*	1.8	1.8	1.8	1.8	1.8	2.0	3.0	1.0
17	Long-tailed Tit	*Aegithalos caudatus*	–	–	–	–	–	–	1.0	–
18	Marsh Tit	*Parus palustris*	–	1.8	–	–	–	–	–	–
19	Blue Tit	*Parus caeruleus*	1.8	1.8	1.8	3.6	1.8	11.5	17.5	13.0
20	Great Tit	*Parus major*	3.6	3.6	3.6	3.6	1.8	12.5	14.5	11.0
21	*Nuthatch*	*Sitta europaea*	–	–	–	–	–	*1.0*	*2.0*	*3.0*
22	Short-toed Treecreeper	*Certhia brachydactyla*	–	–	–	–	–	3.0	5.0	4.0
23	Magpie	*Pica pica*	–	–	–	1.8	1.8	1.0	1.5	1.0
24	Carrion Crow	*Corvus corone*	1.8	1.8	1.8	–	–	–	–	–
25	Starling	*Sturnus vulgaris*	7.1	5.4	5.4	8.9	7.1	6.0	7.5	8.0
26	House Sparrow	*Passer domesticus*	17.8	14.3	17.8	16.1	17.9	–	–	–
27	Tree Sparrow	*Passer montanus*	3.6	5.4	3.6	7.1	7.1	–	–	–
28	Chaffinch	*Fringilla coelebs*	12.5	12.5	12.5	14.3	16.1	12.0	14.0	10.0
29	*Serin*	*Serinus serinus*	*3.6*	*1.8*	–	*1.8*	–	–	–	–
30	Greenfinch	*Carduelis chloris*	5.4	7.1	8.9	10.7	10.7	4.0	7.0	2.0
31	Goldfinch	*Carduelis carduelis*	1.8	–	–	–	–	2.0	1.0	1.0
32	Bullfinch	*Pyrrhula pyrrhula*	–	–	–	–	–	–	0.5	–
33	Hawfinch	*Coccothraustes c.*	–	–	–	–	–	1.0	1.0	–
	Number of species		18	17	16	21	21	21	23	20
	Number of territories		100.1	98.4	100.2	132.4	132.4	138.0	180.0	125.0
	turnover rate between successive years of study			8.6	9.1	18.9	4.8	23.8	4.5	16.3
	overall turnover rate		42.1							

from 1.9 in 1953 to 2.8 in 1978 (Ravussin & Mellina 1979), respectively. The ratios from plots in Bialowieza National Park are by far the lowest we calculated.

These results show that high Blackbird/Chaffinch ratios are typical for urban habitat types such as parks and cemeteries, not in the past but at present. We therefore regard this ratio as a suitable measure to describe the progress of urbanisation in breeding bird communities.

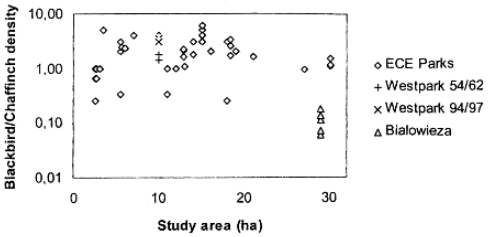

Fig. 1 Density ratio of Blackbirds to Chaffinches in different habitats

There could be an excess of Blackbird males in urban parks (Erz 1964) so that the number of breeding pairs in the Westpark might be lower than the number of singing males counted and taken as an indication for Blackbird territories. However, this has no effect on the density ratio of Blackbirds to Chaffinches as a measure of urbanisation.

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