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Breeding bird densities in some urban versus non-urban habitats: the Dijon case

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Abstract: The composition of bird assemblages in the parks of Dijon, Burgundy — France, is Central-European in character and similar to that found in the nearest forests. This confirms that urban green areas harbour a set of birds gained from the surrounding habitats, except for some species originating from the waves of urbanized (synurbic) populations leaping from one human settlement to another (e.g. *Passer domesticus*, *Streptopelia decaocto*, *Serinus serinus*). Censuses repeated after years in a young park show that bird colonization of urban area proceeded even when no suitable habitat changes had occurred. In an old park of Dijon an extraordinary bird density has been found, 8–10 times exceeding that in the neighbouring forests or younger urban parks. The density of Stock Doves *Columba oenas* (c. 28 p/10 ha) is there among the highest in Europe. Such high urban densities cannot be explained by the habitat structure suitability alone nor by “species-area effect”. They apparently result from the absence of main predators and coincidental availability of rural food resources within the reach of feeding flights, similarly as this was found in some Polish studies.

Key words: Dijon — France, urban birds, population densities, predation impact

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INTRODUCTION

Earlier Polish studies have concluded that populations of some urban birds may occur in densities distinctly higher than in more natural habitats, as well as that a lower predation pressure in some urban parks may influence the structure of bird assemblages (Tomiałojc 1980a, 1982, 1985, Tomiałojc & Profus 1977). According to those results the predation is usually working alongside the trophic factor, and an amelioration of the first factor may, under special urban conditions, produce dramatic effects.

Any local result should be tested against independent data, however. The French urban parks and forests, as situated a thousand kilometres apart, are a suitable site for checking the validity of those earlier conclusions. Moreover, very dense breeding populations of some birds found in the Parc de La Colombière in Di-

jon, (Burgundy, France) could be recommended as a splendid object for future more detailed comparative studies if seen both against the Central-European urban results and against French non-urban data.

The paper touches upon three points:

1. the changes in the breeding avifauna composition of a young urban park after eleven and fifteen years;
2. the comparison of urban and non-urban data from the region of Dijon, offering an explanation to the exceptionally high bird densities found in the city;
3. the question why some urban census data differ among distant cities.

STUDY AREA

The city of Dijon (c. 150 000 inhabitants, or c. 300 000 in its whole agglomeration), an ancient capital of Bur-

gundy, lies amidst fertile rural areas in the river valley. Larger forest complexes are situated 5–20 km apart. Two parks chosen for study are located within the peripheral zone of the city, having been surrounded by urban development only since the post-war times. They differ in the age and structure of their vegetation.

Parc des Sports (12.5 ha)

Established in c. 1934 as a part of a larger complex of open green spaces with scattered clumps of woody and bushy vegetation. At the time of Hortigue's (1967–1969) study it adjoined the rural areas and had younger bushy vegetation. Yet its general structure, as described and shown in a photograph by Ferry (1965), was not much different from that in the early 1980s. Between the 1960s and 1980s the horticultural treatment relaxed somewhat while the coverage by vegetation remained virtually the same. The park comprises an area of 3.5 ha of sporting grounds and 9 ha of decorative lawns with the clumps of luxuriant (up to 6 m high) bushes and several rather low coniferous trees with no holes nor nest-boxes. About 35% of the park area constitute unproductive surfaces with concrete or gravel. A few building-like sports constructions offer nest-sites to *Passer domesticus* and *Phoenicurus ochruros*. The area is frequented by crowds of people during sports events, and remains isolated from the neighbouring green spaces by busy streets. Main habitat changes developed with the progress of time were: a) maturation of bushes — they became higher and less dense at the ground (Ferry 1965 and pers. comm.); b) increased spatial isolation of the park from rural areas.

The Parc de La Colombière (c. 30 ha; 25 ha censused)

A contrastingly different park, established well in the XIX century. Once situated on the outskirts of the town, recently forms an "island" of arboreal vegetation surrounded by a suburban development. As early as 50 years ago its vegetation was much like during my study (C. Ferry, pers. comm.). The censused part is densely wooded with up to 30 m high and c. 150-year old trees of *Tilia cordata*, *Aesculus hippocastanum*, *Fraxinus excelsior*. Some trees were removed just before the breeding season of 1980, which reduced slightly the otherwise high number of natural tree-holes. In 1980 there were only a few small bushes beneath, and no young-tree layer, nor nest boxes. Most of the ground

was covered by a luxuriant ivy *Hedera helix* mat, climbing up to several metres onto tree stems. The pedestrian traffic was heavy only during the afternoon hours.

Forêt de Citeaux

The urban data from Dijon have been compared with the census results from a 20 km distant woodland complex (35.8 km²). These are mostly mature oak-beech-ash *Quercus pedunculata-Fagus sylvatica-Fraxinus excelsior* stands situated in the Saone river valley (190–226 m a.s.l.). In the oldest patches of this forest two census plots were studied by Ferry & Frochot (1968, 1985). General physiognomy of the old forest recalls that of the Parc de La Colombière, though the presence of bushes, young trees, different tree species composition, and the shortage of holes, make the main difference.

METHODS AND MATERIAL

In Parc des Sports the counts of birds were conducted with the help of variants of the territory-mapping method. It was impossible to reveal how far Hortigue's (1967–1969) version differed from that used in 1980, when my counts were performed in April and completed by Jean Roché, or in 1984 (Bakyono 1984). The number of visits per season varied between 8 in 1980 and 28 in the 1960s. However, in 1980 several compensatory improvements were introduced to increase the efficiency of single visit: the visits lasted longer, observations were focused on recording simultaneously active birds and considerable number of nests was found (Tomiałojć 1980b). Additionally, the habitat transparency made differences in counting method less essential. Therefore I do not expect serious incomparability in field data, except those in the case of *Passer domesticus*. While censusing this species, the observers relied on different clues: the early one was recording "clusters of permanent occurrence", while the later ones ignored foraging flocks as visitors from outside and recorded only "the territorial males or nests".

More serious were the differences in the data interpretation. To reduce them, at least between the 1980 and 1984 results, jointly with E. Bakyono we re-analyzed all the species maps, discussing and negotiat-

ing differences. Our original independent estimates agreed in the case of 85 territories and differed in 14. Of the latter ones four cases probably resulted from my experience being limited only to April counts. In the remaining 5% of cases the initial data were over- or under-estimated by 0.5 to 1.5 territory per species. It was because of a different weighing of: a) the observations of apparent non-breeders (the main cause), b) marginal territories, c) the presence of a corvid nest within the park boundaries, when other clues suggested half of the territory being outside, d) the lack of even a single contemporary record of high territorial importance between two neighbouring "paper territories". For well-singing species, as *Luscinia megarhynchos* or *Phylloscopus collybita*, such a lack of contemporary contacts to one analyst suggested two "paper territories" being in fact one territory with two song-posts while to the other "two clusters", hence, two true territories.

In spite of relying on the same set of international recommendations (IBCC 1969) with later improvements for the territory-mapping method (Tomiałojć 1980b, Bibby *et al.* 1992), certain subjectivity in the interpretation of bird behaviour during the counts, as well as in the decisions while analyzing and estimating the numbers of territories, cannot be avoided (cf. Verner & Milne 1990). Local "traditions" and individual experience may inflict subjectivity even into this otherwise quite efficient method.

The data from another of Dijon green spaces are much less accurate. Those from Parc de La Colombière base on my 4 counts performed only between 12 to 19 April 1980, and supplemented by C. Ferry visits on 10 and 17 May. As the absence of leaf-cover in April increased the efficiency of visits, hence most territory owners were recorded contemporarily with their neighbours and a high proportion of *Corvus frugilegus*, *C. monedula*, *Columba oenas*, *Sturnus vulgaris*, *Passer montanus*, *Turdus merula* nests was found. Both factors considerably enhanced the accuracy of counts. Yet, an incomplete character of this census causes that the numbers obtained (Tab. 2) are only a conservative approximation. Moreover, some individuals met in April could not be allocated to the breeding or non-breeding fraction. Some species may have been omitted or underestimated if were breeding later in May or June (e.g. *Oriolus oriolus*, *Muscicapa striata*, *Columba palumbus*).

The bird censuses performed in Parc des Sports de Dijon are complete enough to be compared with the other data directly. In spite of very approximate character of the data from Parc de La Colombière, their uniqueness forced their use for the formulation of a broader, even if very tentative, interpretation.

RESULTS

Birds in Parc des Sports

The results from five years (Tab. 1) show that the species richness of the breeding bird assemblage fluctuated wave-like: it decreased during the 1960s while in 1984 returned to the previous level.

The assemblage composition got transformed, with two processes being involved. The first one was triggered by maturation of vegetation and/or by horticultural activity. According to Hortigue (1967–1969), such human activity was responsible for a decline in some species (*Carduelis chloris*, *Fringilla coelebs*, *Serinus serinus*) during the 1960s. The disappearance of breeding *Hippolais polyglotta*, once studied in this area by Ferry (1965), as well as of other warblers (*Sylvia borin*, *S. communis*, *Phylloscopus trochilus*), *Saxicola torquata* and the granivores (*Carduelis cannabina*, *Emberiza cirrus*) may be explained by a growth of bushes and by an increasing isolation of this park from the source area (farmland). However, this vegetation maturation found only slight reflection in some increase in the abundance of *Paridae* and *Certhia brachydactyla*.

The main changes reflect a general process of colonization of urban habitats by several European birds. Both urban green areas, Parc des Sports in Dijon and Cemetery in Lausanne (after Ravussin & Mellina 1979), have been newly colonized by the following species: *Streptopelia decaocto*, *Columba palumbus*, *Corvus corone*, *Sturnus vulgaris*, *Phylloscopus collybita*. Additionally *Troglodytes troglodytes* has settled to breed in Dijon, while *Erithacus rubecula* at least in Lausanne. In both towns a substantial increase in numbers has also been demonstrated for *Sylvia atricapilla*, *Pica pica* and *Turdus merula*, though in the last species this increase occurred much earlier in Lausanne than in Dijon.

All these species tend to increase and expand their urban populations over most of Europe (Bezzel 1982, Luniak 1983). Their scarcity or absence in the Lausanne

Table 1. Breeding birds in Parc des Sports de Dijon (12.5 ha). After Hortigue (1967–1969), own data (1980) and after Bakyono (1984) — reanalysed jointly. Symbols: I — colonization or increase, D — decrease, 0 — no change.

[Tabela 1. Liczba zajętych terytoriów lęgowych w Parc des Sports w Dijon (12,5 ha). Dane według Hortigue (1967–1969), własne (1980) i według Bakyono (1984) ocenione wspólnie. Skróty: I — kolonizacja lub wyraźny wzrost liczebności, D — spadek liczebności, 0 — brak zmian.]

| Species | Number of territories | | | | | Averaged density (p/10 ha) | | Change |
|-------------------------------|-----------------------|---------|---------|-------|-------|-------------------------------|---------|--------|
| | 1967 | 1968 | 1969 | 1980 | 1984 | 1967–69 | 1980–84 | |
| <i>Carduelis chloris</i> | 19.5 | 9 | 6.5 | 19 | 9.5 | 9.3 | 11.4 | 0 |
| <i>Turdus merula</i> | 6 | 4 | 3 | 22 | 29 | 3.5 | 20.4 | I |
| <i>Serinus serinus</i> | 15 | 11 | 9.5 | 6 | 5 | 9.4 | 4.0 | D |
| <i>Fringilla coelebs</i> | 8 | 5 | 2.5 | 5 | 5.5 | 4.1 | 4.0 | 0 |
| <i>Passer domesticus</i> | 10? | ? | ? | 3 | 12.5? | ? | 6.2? | ? |
| <i>Sylvia atricapilla</i> | 4 | 4 | 3 | 9.5 | 6.5 | 2.9 | 6.4 | I |
| <i>Pica pica</i> | 2 | 2 | 3 | 4 | 5 | 1.8 | 3.6 | I |
| <i>Parus major</i> | 3.5 | 2.5 | 2 | 3.5 | 4 | 2.1 | 3.0 | I |
| <i>Parus caeruleus</i> | 1 | 1 | 1 | 3 | 1 | 0.8 | 1.6 | I |
| <i>Luscinia megarhyn.</i> | 4 | 3.5 | 3 | 1 | 2.3 | 2.8 | 1.4 | D |
| <i>Hippolais polyglotta</i> | 3.5 | 1 | 0.5 | 0 | 0.5–1 | 1.3 | 0.6 | D |
| <i>Sylvia borin</i> | 2 | 2 | 2.5 | 0 | 0 | 1.7 | 0 | D |
| <i>Sylvia communis</i> | 0 | 1 | 0 | 0 | 0 | 0.3 | 0 | D |
| <i>Sylvia curruca</i> | 0 | 0 | 0 | 0.5–1 | 1 | 0.0 | 0.7 | I |
| <i>Phylloscopus collybita</i> | 0 | 0 | 0 | 2 | 2 | 0.0 | 1.6 | I |
| <i>Ph. trochilus</i> | 0 | 0 | 1 | 0 | 0 | 0.3 | 0.0 | D? |
| <i>Phoen. phoenicurus</i> | 1 | 0 | 0.5 | 0 | 0 | 0.4 | 0.0 | D |
| <i>Phoen. ochruros</i> | 1 | 1 | 0.5 | 2.5 | 2 | 0.6 | 1.8 | I |
| <i>Saxicola torquata</i> | 0.5 | 0 | 0 | 0 | 0 | 0.1 | 0 | D |
| <i>Regulus regulus</i> | 1 | 0 | 0 | 0 | 2 | 0.2 | 0.8 | I |
| <i>R. ignicapillus</i> | 1 | 0 | 4 | 2 | 1 | 1.3 | 1.2 | 0 |
| <i>Carduelis carduelis</i> | 3.5 | 1 | 1 | 0 | 0 | 1.4 | 0.0 | D |
| <i>Carduelis cannabina</i> | 1 | 0 | 0 | 0 | 0 | 0.2 | 0.0 | D |
| <i>Emberiza cirlus</i> | 3.5 | 1 | 0.5 | 0 | 0 | 1.2 | 0.0 | D |
| <i>Hirundo rustica</i> | 0 | 1 | 0 | 0 | 0 | 0.2 | 0.0 | D |
| <i>Sturnus vulgaris</i> | 0 | 0 | 0 | 2.5 | 0 | 0.0 | 1.0 | I |
| <i>Coc. coccothraustes</i> | 0 | 0 | 0 | 0 | 1 | 0.0 | 0.4 | I |
| <i>Certhia brachydactyla</i> | 0 | 0 | 0 | 0 | 1 | 0.0 | 0.4 | I |
| <i>Trogl. troglodytes</i> | 0 | 0 | 0 | 2.5 | 0 | 0.0 | 1.0 | I |
| <i>Aegithalos caudatus</i> | 0 | 0 | 0 | 1 | 0 | 0.0 | 0.4 | I |
| <i>Corvus corone</i> | 0 | 0 | 0 | 0 | 2.5 | 0.0 | 1.0 | I |
| <i>Streptopelia decaocto</i> | 0 | 0 | 0 | 3 | 4.5 | 0.0 | 3.0 | I |
| <i>Streptopelia turtur</i> | 0 | 0 | 0 | 1 | 0 | 0.0 | 0.4 | I |
| <i>Columba palumbus</i> | 0 | 0 | 0 | 3 | 1 | 0.0 | 1.6 | I |
| <i>Erithacus rubecula</i> | 0 | 0 | 0 | 2? | 0 | 0.0 | ? | ? |
| Species number | 20 | 16 (17) | 17 (18) | 20 | 21 | | | |
| Pairs | 91 | 50 | 44 | 95 | 99 | | | |
| Density p/10 ha | 72.8 | 40.0 | 35.2 | 76.2 | 79.4 | 49.3 | 77.8 | |

cemetery during the 1950s or in Parc des Sports during the 1960s can hardly be explained by merely the somewhat younger vegetation, and suggests a triggered by unknown reasons retardation in comparison with other European regions.

The changes in the urban habitat character and in the use of Dijon peripheries around Parc des Sports have probably contributed to disappearance of the species known to decline also elsewhere, like *Phoenicurus phoenicurus*, some low-nesting warblers and bun-

tings (Tomialojć & Profus 1977, Ravussin & Mellina 1979, Gnielka 1981, Luniak 1983).

Some species met in Parc des Sports remained non-breeding migrants or visitors from the neighbourhood: *Dendrocopos major*, *Sitta europaea*, *Pyrrhula pyrrhula*, *Prunella modularis*, *Phylloscopus trochilus*, *Ficedula hypoleuca*, *Parus ater*, *Turdus viscivorus*, or ceased to breed — *Sylvia communis*, *Carduelis carduelis*, *Emberiza cirlus* (the latter seen only in April 1980 and 1984). They may still breed occasionally in the area in some years.

Birds in Parc de La Colombière

However incomplete this census was, it has revealed an extraordinarily high overall bird density (c. 624 p/10 ha) which needs explanation. Even without colonial *Corvus frugilegus* the remaining density is being twice that in Parc des Sports or in forests (Tab. 2). The true overall density might have been still higher. These figures are mostly due to abundant colonial species and able to forage outside the town. Yet, high densities were also revealed for other species (*Turdus merula*, *Certhia brachydactyla*, *Sitta europaea*, *Sylvia atricapilla*) and, most surprisingly in view of scarcity of bushes and absence of coniferes, for *Troglodytes troglodytes* and *Regulus ignicapillus*.

Table 2. Approximate numbers of birds breeding in the Parc de La Colombière, Dijon, in 1980. (Data for 25 ha; a wooded part only). ? — breeding uncertain.

[Tabela 2. Przybliżona liczba par lęgowych i zagęszczenie ptaków w Parc de La Colombière, Dijon, w r. 1980. Dane z zadrzewionej części o pow. 25 ha. ? — gniazdowanie niepewne.]

| Species | Number of pairs | Density p/10 ha |
|--------------------------------|-----------------|--------------------|
| <i>Corvus frugilegus</i> | c. 1150 nests | 460 |
| <i>Columba oenas</i> | c. 70 pairs | 28 |
| <i>Corvus monedula</i> | > 42 | 16.8 |
| <i>Carduelis chloris</i> | c. 39 | 15.6 |
| <i>Turdus merula</i> | 37 | 14.8 |
| <i>Fringilla coelebs</i> | 33–35 | 13.6 |
| <i>Parus caeruleus</i> | 29–30 | 11.8 |
| <i>Sturnus vulgaris</i> | > 28 | 11.2 |
| <i>Parus major</i> | 20 | 8.0 |
| <i>Passer montanus</i> | c. 17 | 6.8 |
| <i>Certhia brachydactyla</i> | 16–17 | 6.6 |
| <i>Serinus serinus</i> | 12 | 4.8 |
| <i>Sitta europaea</i> | 9.5–11.5 | 4.2 |
| <i>Sylvia atricapilla</i> | 9–10 | 3.8 |
| <i>Troglodytes troglodytes</i> | 8–9 | 3.4 |
| <i>Carduelis carduelis</i> | c. 8 | 3.2 |
| <i>Passer domesticus</i> | 5 (?) | 2.0 |
| <i>Regulus ignicapillus</i> | 5 | 2.0 |
| <i>Phoenicurus phoenicurus</i> | 4–4.5 | 1.7 |
| <i>Streptopelia decaocto</i> | 1–3 | 0.8 |
| <i>Columba palumbus</i> | > 2 | 0.8 |
| <i>Turdus philomelos</i> | 1–3 (?) | 0.8 |
| <i>Dendrocopos minor</i> | 2 | 0.8 |
| <i>Dendrocopos major</i> | 1(2 ?) | 0.4 |
| <i>Parus palustris</i> | 1 | 0.4 |
| <i>Aegithalos caudatus</i> | 1 | 0.4 |
| <i>Garrulus glandarius</i> | 1 | 0.4 |
| <i>Picus viridis</i> | 1 | 0.4 |
| <i>Strix aluco</i> | 1 nest | 0.4 |
| <i>Erithacus rubecula</i> | 1(?) | (?) |
| Totals: | ? | c. 624 |
| Without Rooks: | | c. 164 |

The avifauna composition differs sharply between two parks. The index of overall similarity of species densities, using Jaccard's formula (Tomiałojć & Profus 1977), is only 44.4%, even when *Corvus frugilegus* colony is excluded. Also the species richness (30 species) is in the old park twice that from Parc des Sports, largely due to presence of corvids, woodpeckers, and such arboreal species as: *Passer montanus*, *Phoenicurus phoenicurus*, *Sitta europaea*, *Turdus philomelos*. Apart from confirmed breeders, other species were recorded once or twice in April 1980: *Turdus viscivorus*, *Phylloscopus collybita*, *Ph. trochilus*, *Ph. sibilatrix*, *Ficedula hypoleuca*, *Parus montanus*, *Pica pica*, *Hirundo rustica*, *Buteo buteo*. Some of them might have bred in the area later or in other years.

DISCUSSION

The character and changes in the bird community of Dijon urban parks

Two models of bird colonization of the urban areas have been proposed. The first one assumes that bird populations adapted to urban life (synurbic) emerge rarely and then leap from town to town, being separated from natural populations of the species. Such was the classical explanation of the eastward spread of the urban Blackbirds (Steinbacher 1942). The second model assumes additionally that urban populations may emerge in distant cities independently, mostly as a result of the population dynamics processes operating in the non-urban (source) populations (Tomiałojć 1985). Empirical data offer support to both models, depending on a group of birds: a) species inhabiting human constructions — artificial rocks — tend to be invaders from southern Europe or Near East (*Passer domesticus*, *Phoenicurus ochruros*, *Apus apus*, *Athene noctua*, *Delichon urbica* etc.), and b) species of urban green spaces originate mostly from the surrounding non-urban habitats, though exceptions occur (*Serinus serinus*, *Streptopelia decaocto*).

The bird species composition of Dijon green spaces resembles the avifauna of the surrounding non-urban habitats, and has a central-European character. Only a few and mostly quantitative features suggest slight southern (Mediterranean?) influences: a relatively common occurrence of *Regulus ignicapillus* and a scar-

city of *Phylloscopus collybita* (cf. Blondel 1982, 1985, Blondel & Farré 1988). These are tentative impressions, as it is still unclear what a typical Mediterranean urban avifauna is like. A few bird community studies in parks of Milano (Moltoni 1953), Livorno, (Dinetti & Ascani 1985), Napoli (Fraissinet 1984), Rome (Battisti 1986, Salvati 1995), Bergamo (Guerra 1979) or Madrid (Alonso & Purroy 1979) — give a diverse picture of bird fauna composition, usually derived only from very misleading one-park-per-city data.

An assumption that urban birds from Dijon parks are direct descendants of their non-urban conspecifics is consistent with a clear parallelism in co-occurrence of particular species in equivalent densities in both types of habitats. The high densities in Dijon of such species as: *Columba oenas*, *Turdus merula*, *Parus caeruleus*, *Certhia brachydactyla*, *Serinus serinus* co-occur with their relatively good numbers around this city, while the absence in town or scarcity of species like: *Erithacus rubecula*, *Sturnus vulgaris*, *Turdus philomelos*, *Prunella modularis* is again similar to their relative scarcity outside it (Ferry & Frochot 1968, 1985). This supports the generalization (Tomiałojć 1985) that a colonization of urban areas usually starts in the region with relatively dense non-urban population of a species.

The advancement of bird synurbization

To understand the process of bird adaptations or phenotypic adjustments to urban conditions — the detailed data on the changes in the composition and structure of urban bird communities are necessary. As continuous monitoring is laborious, repetitions of past censuses are a parsimonious substitute (Hampel & Heitkamp 1968, Ravussin & Mellina 1979, Mizera 1980 etc.).

The changes revealed in the avifauna of Parc des Sports indicate that the Dijon bird community is developing in the same direction as that observed in the down-town parks of cities in Germany and Poland (Bezzel 1982, Luniak 1983, Tomiałojć 1985). Yet, some differences also do exist. A special attention should be given to details of breeding occurrence in Dijon of some elsewhere very adaptable species, which in French cities for a long time have remained scarce or absent.

Columba palumbus. This species has for long been unknown from French cities, except for the Paris region, from where it was reported as urbanized as early

as in the 1840s (Tomiałojć 1976). This retardation coincides well with a generally low density of the species in French rural areas (Hermant 1989), apparently owing to a heavy hunting pressure (Purroy *et al.* 1984). On this background it is of interest that three active nests were recorded in 1980 in Parc des Sports, at least two pairs in Parc de La Colombière and an old nest in the cemetery of Péjoces. In the same year 1–3 territorial pairs were also seen in the municipal park of Lyon while already in 1977 some territorial pairs in Geneve, Switzerland (own obs.). Colonization of southern French cities has, thus, recently been proceeding (cf. Tomiałojć 1976). However, a contemporary arrival of the first pairs of *Corvus corone* to French urban parks may inhibit an increase in density of the urban Woodpigeons, similarly as this happened in Wrocław (Tomiałojć 1980a). Presumably under the pressure of Carrion Crows Woodpigeons have deserted the parks of Milano (own data from 1997), from where they were earlier reported by Moltoni (1953)

Columba oenas. Also this species invades old urban parks of Europe (Alonso & Purroy 1979, Tomiałojć in prep.). The unusual number of c.70 territorial pairs in Parc de La Colombière, where this species is known to breed for four–five decades (C. Ferry, pers. comm.), forms the highest density after an aggregation found on a river-island at Rothrist/Aargau in Switzerland (Glutz von Blotzheim & Bauer 1980). Even if in the Dijon park not all those pairs bred, as some hollow trees were cut down in March 1980, this is an astonishing density for a species which in the nearby-located forests occurs in scattered pairs or very small groups only (Ferry & Frochot 1968, 1985). As with the Woodpigeon "colonies" in Polish cities (Tomiałojć 1980a), a long-term relative safety of the urban site, additionally rich in holes, was probably the main cause for developing such an aggregation.

Troglodytes troglodytes. The Wren is a widespread urban bird of the North-West Europe while, as a rule, it avoids cities of Central and Northern Europe. Its breeding in both Dijon parks is of interest, the more so that in Parc de La Colombière 8–9 pairs (a nest found) occurred in an apparently unsuitable habitat, entirely devoid of bushes. Wrens thrive there only thanks to the presence of a thick mat of the ivy.

Certhia brachydactyla. The absence of old rough-bark trees in Parc des Sports prevented its breeding

until 1983. Yet, in the other park a remarkably high density (6.8 p/10 ha) was found already in 1980, surpassing all values known from the best French forest habitats (Ferry & Frochot 1968, 1985, Muller 1985).

Regulus ignicapillus. It is a rare breeder in the parks of Central or West Europe. It may be considered a bird of mediterranean urban parks, as it commonly breeds in the parks of Madrid (Alonso & Purroy 1979), Rome (Battisti 1986, Salvati 1995), Livorno (Dinetti & Ascari 1985) and Lyon (own obs.), though is absent in Marseille (Marchetti & Gallner 1976 after Blondel 1985), Bergamo and Milano (Moltoni 1953, Guerra 1979). Several singing males registered throughout the green spaces of Dijon in April 1980, though the breeding proved only for Parc des Sports in 1984, deserve attention. Especially remarkable is its (supposed) breeding in the conifer-devoid Parc de La Colombière.

Erithacus rubecula, *Turdus philomelos*, *Prunella modularis*. Very low numbers and uncertainty as concerns their breeding status in Dijon parks resemble the situation in other central-European cities. *Erithacus rubecula*, as a species present in Parc des Sports throughout April 1980 but probably failing to breed, deserves future observations. The scarcity in Dijon of these three species is of interest, as they commonly breed in NW-European cities, while avoid eastern and southern ones, presumably due to their more arid urban climate (Tomiałojć 1992).

Corvus frugilegus, *C. monedula*, *Sturnus vulgaris*, *Passer montanus*. These species tend to be scarce in green areas of western cities while abundant in mature parks of Central and Eastern Europe (Tomiałojć & Profus 1977, Bezzel 1982, Luniak 1983). Their fairly good densities in Parc de La Colombière are more like the Central-European ones.

Turdus merula. The species occupies all green areas of Dijon, including a small down-town park Darcy (Ferry & Ferry 1965). Its densities increase with time, reaching c. 20 p/10 ha, which is half the figure from Lausanne and one third of the European maxima from Oxford, Berlin or Budapest (Snow 1956, Ravussin & Mellina 1979, Stephan 1985, own obs.). Symptomatically, in both Dijon parks heavy fights between females were recorded (as in Budapest), a behaviour virtually unknown in forest population (Tomiałojć 1994). Out of 12 nests found in Parc de La Colombière three were in tree holes and one on the bare ground at the base of a

horse chestnut. This reflects a shortage of bushes and recalls a pristine way of species nesting in ancient forests (e.g. the Białowieża Forest).

Urban versus non-urban bird densities

With the advancement of their synurbization an increase in the overall bird density, and in densities of some particular species, becomes a well known, though not universal, phenomenon in the central and north-western European cities (Lack 1937, Dyrz 1963, Ferry & Ferry 1965, Tomiałojć 1970, 1994, Tomiałojć & Profus 1977, Mizera 1980, Bezzel 1982, Górski 1982 and others). Direct comparisons of equivalent urban vs. non-urban habitats remain scanty, especially for the western and south-western part of the continent, preventing wider generalizations. Therefore, a possibility of comparing the bird densities from Dijon parks with the data from mature deciduous forests of eastern France (Ferry & Frochot 1968, 1985, Muller 1985) is of value.

Of both Dijon parks only Parc de La Colombière resembles a mature deciduous forest. Its old trees, though planted, are structurally not unlike those in the oldest patches of the Forêt de Citeaux (Ferry & Frochot 1968, 1985, own observ.). The main structural difference between them stems from almost complete absence of bush and young-tree layers in the park, though both types of habitats have them poorly developed. In contrast to the very high density of birds (c. 350 p/10 ha) in the 2-ha Darcy square of Dijon (Ferry & Ferry 1965), the case of Parc de La Colombière cannot be explained in the light of "island biogeography" literature, e.g. by the "area-size-effect". A reasonable size (25 ha) of the wooded part of the park diminishes possible confusing influence of the effect of very small plots (Gromadzki 1970, Opdam *et al.* 1985, van Dorp & Opdam 1987, Haila 1988, Kurlavicius 1995). Parc de La Colombière forms a fairly big "island" of high-canopy habitat. Because of its sharp spatial isolation from nearby woodlots and forests and according to the island biogeography predictions, this park should have bird species richness and density values more like those in larger forests, only slightly impoverished (Whitcomb *et al.* 1981, Wilcove 1985, Haila 1988, Kurlavicius 1995). The Dijon field data do not entirely confirm such a prediction: while the urban species richness is similar to that in the forest, so the urban overall density exceeds that in the oldest French forests 8–10

times (Tab. 3). Even when the Rook colony is excluded from calculation, the remaining density is still 2.2 to 2.8 times that in the neighbouring forests.

tend to fly to open farmland (Fig. 2). High park densities do not stem, therefore, from better food resources of park areas themselves.

Table 3. The overall bird densities in some urban parks and forests of France and Switzerland.

[Tabela 3. Łączne zagęszczenie ptaków w niektórych parkach miejskich oraz lasach Francji i Szwajcarii. Podano wielkość powierzchni próbnych, zagęszczenie i autorstwo danych.]

| Habitat | Plot (ha) | p/10 ha | Authors |
|--|-----------|---------|------------------------------|
| Forests | | | |
| 1. Forêt de Citeaux (old parts) | 16–20.6 | 59–75 | Ferry & Frochot (1968, 1985) |
| 2. Five old forest plots, Vosges du Nord | 9–12 | 75.7 | Muller (1985) |
| Urban parks (Young) | | | |
| 1. Parc des Sports, Dijon | 12.5 | 77.8 | this study |
| 2. Cimetiere de Lausanne (Old) | 7.8 | 163.9 | Ravussin & Mellina (1979) |
| 3. La Colombiere, Dijon | 25.0 | 624.3 | this study |
| 3a. La Colombiere (without Rooks) | 25.0 | 164 | this study |

Equally sharp contrasts between urban and non-urban data were recorded in other parts of Europe, e.g. in Polish (Tomialojć 1970, 1980a, Tomialojć & Profus 1977, Mizera 1980, Górski 1982, Czyż & Królikowski 1990) or German cities (Mulsow 1980 for Hamburg). In 1998 in the Legnica urban park the number of *Columba palumbus* alone reached the level of 656 nests per 31 ha, which is c. 211 pairs/10 ha, while in the nearby forests it remained till now at the level of 0.5–1.0 p/10 ha (Tomialojć 1980a and unpubl.).

Within the same broad habitat category it is usually the vegetation structure which decides about differences in bird diversity and numbers (Mac Arthur & Mac Arthur 1961). However, when urban park data are confronted with the ecologically distinct forest habitats (Fig. 1), than the structural differences fail to explain why even structurally alike stands, as those of Forêt de Citeaux and Parc de La Colombiere, contain so contrastingly different bird communities. In spite of a much more uniform and less dense tree-layer, the park harbours 40 times higher density of high open-nesters and 2.6 times higher density of hole-nesters than the forest, though only in the latter habitat numerous woodpeckers each year add many new holes.

Detailed analysis of the ecological groupings ("guilds") in the park and forest bird assemblages shows that in old urban parks all the foraging guilds, but birds of prey, occur in densities distinctly higher than in the oldest forests (Tomialojć & Profus 1977, and Fig. 1). Another finding is that most forest birds feed within the wooded area while urban park inhabitants

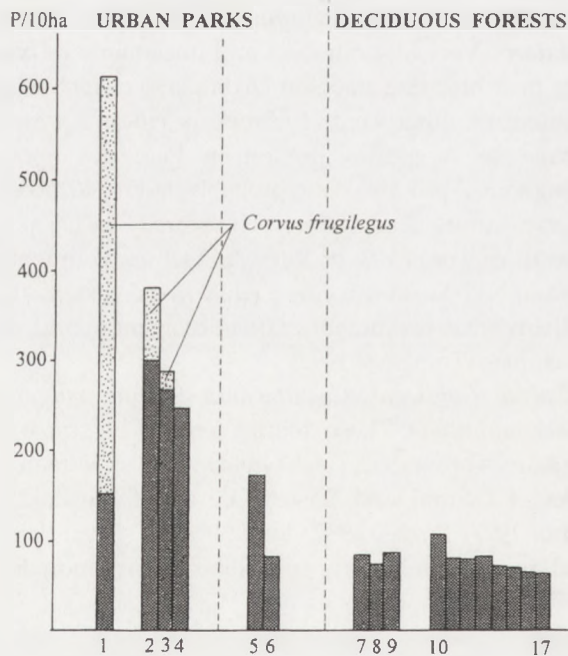


Fig. 1. The overall breeding bird densities in some urban parks and in old deciduous forests. Urban parks: 1 — Parc de La Colombiere, 2 — Down-town part (15 ha) of the Central Park in Legnica (Tomialojć 1970, Tomialojć & Profus 1977), 3 — Słowacki Park, Wrocław (ibidem), 4 — Szczytnicki Park, Wrocław (ibidem), 5 — Cimetiere de Lausanne (Ravussin & Mellina 1979), 6 — Parc des Sports, Dijon, 7–8 — Forêt de Citeaux (Ferry & Frochot 1968, 1985), 9 — old forest stands in Vosges du Nord (Muller 1985), 10–17 — old deciduous and mixed stands in Białowieża Primaevae Forest (Tomialojć *et al.* 1984).

[Ryc. 1. Łączne zagęszczenie ptaków lęgowych w niektórych parkach miejskich i starych liściastych lasach.]

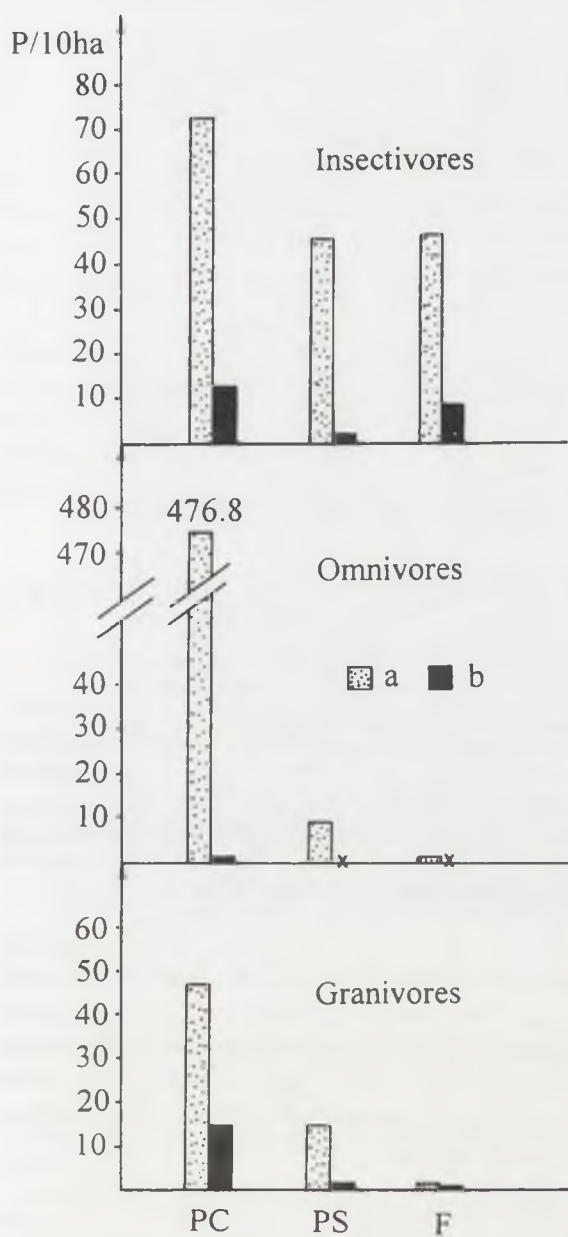


Fig. 2. The abundance of three foraging guilds in urban parks and forests of the Dijon region. PC — Parc de La Colombière, PS — Parc des Sports, F — Forêt de Citeaux. a — birds foraging outside, b — foraging in the wood.

[Ryc. 2. Liczebność trzech grup pokarmowych (ptaków owadożernych, wszytkozernych i ziarnożądów) w zespołach z parków miejskich i lasu w okolicy Dijon. a — ptaki żerujące poza zadrzewieniem, b — zbierające pokarm w obrębie powierzchni próbnej.]

Today it can be generalized that structurally very similar urban and non-urban habitats often (though not always) harbour dramatically different bird assemblages

(Tomiałojć 1970, Tomiałojć & Profus 1977, Fig. 2–4). These sharp differences emerge even in spite of common food resources available to both bird populations. In accordance with this pattern, the breeding avifauna of Parc de La Colombière differs strongly from that of Forêt de Citeaux, and that also it differs from the avifauna of the mid-field woodlots around Dijon (Hermant 1990). Similar is the situation found in the case of high densities reported from fairly large (10–35 ha) parks of Legnica, Wrocław, Poznań, Częstochowa, Słupsk, Halle, Hamburg etc. (Tomiałojć 1970, Tomiałojć & Profus 1977, Mizera 1980, Mulsow 1980, Gnielka 1981, Córski 1982, Czyż & Królikowski 1990). Because most birds in those breeding aggregations tend to feed outside the boundaries of urban parks (Fig. 2), undertaking flights to distant (sometimes up to 5–15 km) feeding grounds (Tomiałojć 1976, 1980a), one may ask why such aggregations did not develop in some mid-field woodlots or rural parks, as situated closer to the foraging areas among fields. There are several apparently suitable small woods amidst the farmland areas around Dijon, as well as around Legnica or Wrocław. There must be another factor differentiating conditions between urban and non-urban woodlots and parks.

The term “ecological release” is used when a population or a part of a bird community increases its density at the absence of a superior competitor. The only ecological group missing for long from the European towns are the birds of prey and, among mammals, the tree-climbing predators (some mustelids have only recently started to penetrate cities). Thus, there is a possibility that high densities in some urban habitats may be a consequence of a kind of ecological release — the release from upon predation pressure. This possibility found an empirical support in the Silesian studies (Tomiałojć 1980a, 1982, in press, Tomiałojć & Profus 1977). The importance of predation or nest-predation as a factor co-acting with food resources, and under some conditions even exceeding them in its impact, has recently been widely acknowledged, chiefly outside Europe (George 1987, Martin 1988, Ricklefs 1989).

It is suggested here, therefore, that the crucial advantage of Parc de La Colombière for birds lies in the absence in its area of important nest-predators and/or predators on adult birds, such as the raptors, stronger corvids (e.g. *Corvus corone*) and carnivores, chiefly the absence of *Martes martes*. This explanation is a testable

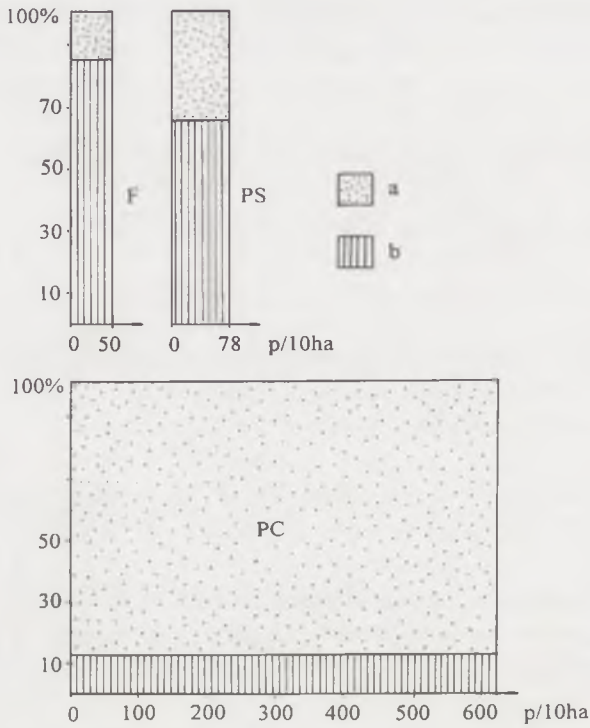


Fig. 3. The share and abundance of two foraging categories in some French bird assemblages in relation to the place of food collecting. Abbreviations as in Fig. 2.

[Ryc. 3. Udział procentowy i liczebność dwóch kategorii ptaków. Oznaczenia jak dla ryc. 2.]

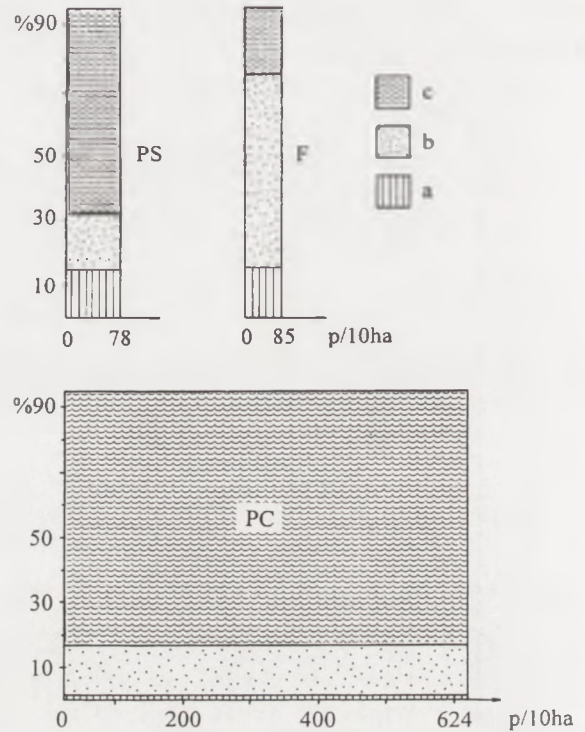


Fig. 4. The share and abundance of three nesting categories in French bird assemblages; a — ground/low nesters, b — hole nesters, c — high open nesters.

[Ryc. 4. Udział procentowy i liczebność ptaków według trzech typów gniazdowania; a — gniazdujące na ziemi lub nisko, b — dziuplaki, c — gniazdujące wysoko w otwartych gniazdach.]

hypothesis which requires future population dynamics studies of neighbouring urban and non-urban populations, as replicated data.

Why the results from some urban parks do not fit the patterns described above?

There can be three main reasons for that:

1. unsuitable structure of a park habitat, e.g. too young or too sparse bush- or tree-layers, or too low trophic value of the local soil;
2. incomplete spatial isolation of the park from the "source" populations of non-urban habitats; the lack of isolation prevents in some (poorly known) way the development of advanced urban features;
3. a shortage of time for development of the advanced synurbic features by the prey-species if the predators colonized the park simultaneously or immediately after the prey had (Tomiałojć 1985).

These three sources of variability should be taken under control before any statistical test for this expla-

nation will be possible. Therefore, any automatically combined random data from urban parks would rather obscure the vision than to clear it. Because of a steady progress in the process of bird synurbization, it is often only a matter of chance, which section of this general process a particular study of the local urban avifauna development depicts.

CONCLUSIONS

1. Comparisons between the past and present quantitative data on the avifauna composition in the Parc des Sports of Dijon reveal long-term trends of three kinds: a) adjustments to local vegetation maturation, b) retreat of birds typical of open rural areas, and c) colonization of Dijon green areas by new bird species, once avoiding its urban territories.

2. Even if very approximate, the present census data indicate clearly that in Parc de La Colombière very

high bird densities occur, exceeding several times the values from the nearby-situated old forests. This agrees with the pattern found in several other Central-European cities.

3. Circumstantial evidence suggests that in Dijon the same reason as that proved to operate in Silesian (Poland) cities — namely the reduced predation pressure (Tomiałojć 1980a, 1982, in press) — is responsible for the development of big local bird aggregations.

4. More accurate census data, and preferably prolonged population dynamics studies, in some French and Mediterranean cities would be of importance for the future generalizations on the European bird synurbanization pattern and for better understanding the mechanism underlying this process.

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STRESZCZENIE

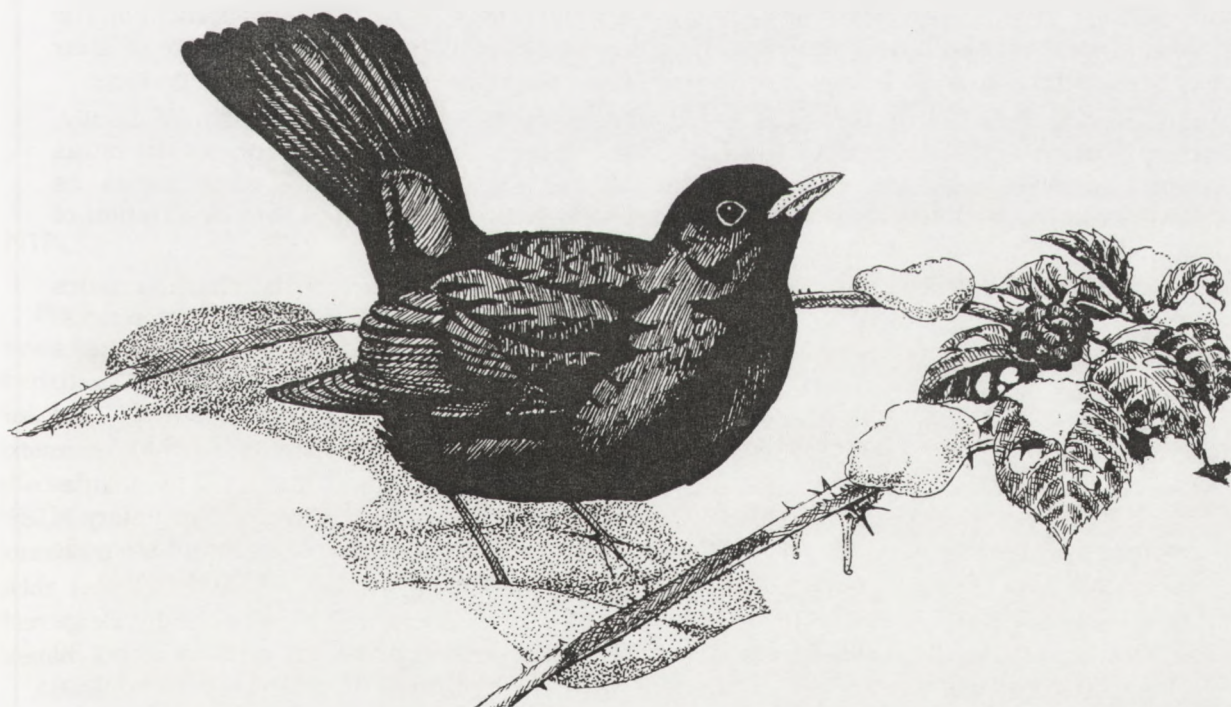
[Porównanie liczebności awifauny lęgowej w środowiskach miejskich i pozamiejskich na przykładzie Dijon]

Wcześniejsze badania przeprowadzone w Polsce wykazały, że populacje niektórych gatunków ptaków mogą w pewnych parkach miejskich osiągać bardzo wysokie zagęszczenia, oraz że główną tego przyczyną jest trwałe obniżenie presji drapieżnictwa gniazdowego. W niniejszej pracy wnioski owe zostały zweryfikowane na niezależnej próbie danych pochodzących z badań przeprowadzonych w odległym o ok. 1000 km francuskim ośrodku miejskim, Dijon (mieście liczącym ok. 150 000 i aglomeracji ok. 300 000 mieszkańców). W roku 1980 zebrano własne dane z dwóch parków tego miasta, które wraz z uzupełniającymi obserwacjami i odrębnymi opracowaniami francuskich kolegów pozwoliły na dokładne (z pomocą metody kartograficznej) ustalenie składu gatunkowego, liczebności ptaków lęgowych i jej zmienności w czasie dla odznaczającego się dość młodym drzewostanem obiektu zieleni miejskiej — Parc des Sports. Awifauna tego parku, badana w latach 1967–69, 1980 i 1984 (Hortigue 1967–1969, Bakyono 1985), wykazała zmiany w czasie wynikające z oddziaływania następujących grup czynników: starzenia się drzewostanu, nasilającej się izolacji od terenów podmiejskich oraz zachodzenia procesów synurbizacyjnych (podobnych do zaobserwowanych w innych miastach środkowo-europejskich). Wykazano, że skład gatunkowy zespołu ptaków w obu parkach Dijon ma charakter środkowo-europejski,

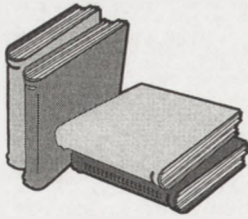
zgodnie z takimże charakterem awifauny niemiejskich obszarów zadrzewionych. Potwierdza to wcześniejsze wnioski, że ptaki zieleni miejskiej na ogół rekrutują się z populacji niemiejskich z otaczających terenów; wyjątkiem są gatunki przybyte w postaci populacji synantropijnych z odległych regionów kontynentu (*Passer domesticus*, *Streptopelia decaocto*, *Serinus serinus*).

Znacznie mniej dokładne dane ilościowe zebrano dla założonego jeszcze w XIX wieku drugiego parku (Parc de La Colombière), gdyż oparto je na 4-krotnym policzeniu ptaków w kwietniu 1980 (z majowymi uzupełnieniami miejscowych obserwatorów). Wyniki okazały się tak wyjątkowe, że uznano je za zasługujące na uwagę pomimo niekompletności. W parku tym stwierdzono jedno z najwyższych w Środkowej Europie zagęszczeń ptaków lęgowych (624 p/10 ha), i to nie tylko wynikiem z wysokiej liczebności gawronów *Corvus frugilegus* oraz gołębi siniaków *Columba oenas*

(ok. 28 p/10 ha). Niemal wszystkie grupy lęgowe wyróżnione tak pod względem miejsc gniazdowania, jak i pod względem zwyczajów pokarmowych występowały w owym środowisku w zagęszczeniach znacznie wyższych niż znane z najbogatszych nawet mieszanych lasów liściastych sąsiednich obszarów Francji (Ryc.1–4). Odnosi się to nawet do żerujących w obrębie parku takich gatunków, jak: *Turdus merula*, *Troglodytes troglodytes*, *Certhia brachydactyla*, *Regulus ignicapillus*. Zauważone prawidłowości sugerują, co zostało uprzednio udowodnione w polskich miastach, że te wysokie zagęszczenia wynikają nie tyle z korzystnych warunków pokarmowych w parku i jego podmiejskim otoczeniu, ani też z małych rozmiarów tej „wyspy zieleni” (liczy ona ponad 25 ha), lecz z wysokiego bezpieczeństwa ptasich lęgów wobec ograniczonego dostępu do tego terenu ważnych drapieżników gniazdowych (por. Tomiałojć 1980a).



rys. J. Dyczkowski



BOOKS RECEIVED

PITTAS OF THE WORLD. A MONOGRAPH ON THE PITTA FAMILY [KURTACZKI SWIATA]

Erritzoe J. 1998. *Pittas of the world. A monograph on the Pitta family.* The Lutterworth Press, Cambridge, 240 pp.

This book is a monograph on little known to the wider audience of ornithologists, egzothic birds — pittas. They comprise a very homogeneous family and most authors include them in single genus *Pitta*. Opinions on the sequence and number of existing species have varied considerably. Authors described at least 30 species (and 67 subspecies) of those bright coloured, small birds. In majority they occur in tropical forests of south-east Asia, but they also exist in Africa and Australia. Pittas' silhouettes are very characteristic — thickset, egg-like torso, short neck and very short (often significantly reduced) tail. It is known that they build their huge and spherical nests of grasses and rootlets, and usually place them on the ground or in forked lower branches. It is common that both parents take care of their youngs, although the fledglings grow fast and three weeks later they are fully independent.

An introduction of this unusual book contains a notes about the origin of family, classification and study of dusky streaks, which seems to be an apomorphy of the pittas and has never been described in detail before. This part includes such issues as information regarding pittas' vocalisation, details of breeding biology and description of the pittas' unique moulting pattern.

Apart of the full descriptions of sexes and the juvenile/immature birds, characteristics of each species also includes all information about distribution, habitat preferences, feeding behaviour and breeding biology. In their book, the authors collected data concerning specimens in captivity, parasites and diseases, hybridisation. Thanks to their work it is possible to get information about recent records, status and conservation, and even list of live birds photographs and museum holdings of skins.

Besides the extremely detailed guide section, the monograph contains also a list of all little-studied islands where pittas have been found and their status if known, world inventory of pitta eggs and nest collections, skeletons and fluid preserved specimens, list of all scientific synonymous and new proposed names. Bibliography encloses more than 1300 references.

The whole work is enriched with magnificent illustrations painted in gouache by Helga Boulet Erritzoe using a dry-brush technique. All described pittas are presented on 32 tables (in most cases a couple or parents with their young). The tables also contain drawings of eggs of twenty pittas species.

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