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Notas Breves

IS THE COMMUNAL ROOSTING BEHAVIOUR OF THE MAGPIE (*PICA PICA*) WIND DEPENDENT? AN EXAMPLE FROM AN ISOLATED POPULATION IN W POLAND

¿LOS DORMIDEROS COMUNALES DE LA URRACA (*PICA PICA*) DEPENDEN DEL VIENTO? UN EJEMPLO PARA UNA POBLACIÓN AISLADA EN EL OESTE DE POLONIA

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The Magpie is a residential non-migratory bird (Goodwin, 1986; Birkhead, 1991). Each pair of birds controls its own territory all the year around. However, in winter this monogamous bird sleeps in communal roosts. Birkhead (1991) discussed some of the main ideas, which may explain this behaviour. There have been many papers concerning magpie roosts (Zink, 1949; Brennecke, 1965; Gyllin & Kallander, 1977; Birkhead, 1991; Górski & Kotlarz, 1997; Bosch & Havelka, 1998), but few have discussed factors which might influence roost sleeping behaviour (Reebs, 1986, 1986a), the impact of temperature or human activity (Ponz & Monros, 2000) or the possible functions of this sleeping system in roosts (Møller, 1985). The influence of weather conditions, including temperature (ºC), wind speed (m/s), relative humidity (%) and snow cover (cm) on the number of observed birds in the roost are examined.

The population of the town of Zielona Góra (51º56' N; 15º30' E) is approximately 120.000 people. The urban area of the town is about 23 km^2 and is still expanding. The town is surrounded by forest, so the urban magpie population is isolated from the surrounding farmland population. Favourable living conditions for this magpie population have resulted in a rapid increase in the population (Bocheński *et al.*, 2001; Jerzak, 2001, 2002). Zielona Góra is a typical central-European town with the old town in the centre, comprised of a ring of XIX century buildings, surrounded by a newer quarter, which has "absorbed" 2 villages. In the town are 3 parks less than 10 ha each. Two of these contained the main magpie roosts. Tysiąclecia Park had one roost, which is continuous with Wyspiańskiego street close by (50-100 m). This is considered as one roost because magpies commonly fly between the two places. The second one was on the outskirts of the town (Piastowski Park). The distance between these parks was about 5 km.

A detailed study was undertaken on the roosts from 1998 to 2001. The study examined

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factors influencing the sleeping behaviour at the roosts over four winter seasons (November – March) 1998-2001 in Zielona Góra. Data were collected on two stable communal roosts of Magpies in two parks.

The birds were counted after twilight when all birds were sleeping in silence. Counts were made easier due to artificial lighting from street lamps. A total count was possible as all birds could be seen. Booth roosts were counted on the same day in both parks. However, due to the long distance between roosts and the limited time available for each inspection, some visits to the suburban park were missed. Data from 79 inspections in the centre and 50 on the outskirts were gathered. Hence, the mean inspection rate for each year differed between the two roosts (Mann-Whitney U-test, $Z = 2.16$, $P = 0.029$) and was 19.7 visits/season ($SD = 3.30$, range 16 - 24) and 12.5 visits/season ($SD = 4.50$ range 6 - 16) in the centre and on the outskirts, respectively. The mean interval between inspections was 7.7 days ($SD = 1.55$) in the centre and 13.0 days ($SD = 7.44$) on the outskirts. In the face of such differences, only data from the roost situated in the centre were used for more detailed, in-depth, analyses. It was assumed that movement of the birds between roosts was minimal. This was justified due to the distance between roosts (around 5 km). Moreover, the field observations confirmed different foraging areas used by birds from both roosts as birds flew to both parks from different directions. Finally, a strong positive correlation was found between the number of birds noted during individual visits on the same day to both roosts (Spearman correlation, $r = 0.48$, $P < 0.001$, $n = 50$).

The time of visits in each year of study was calculated as the number of days after 1st November and is presented in 10-day periods. The examined data included mean daily temperature, wind speed, relative humidity and snow cover obtained from the meteorology station in Zielona Góra.

Weather conditions were very changeable and did not coincide with the date of visits (Spearman correlation; temperature: $r = 0.11$, $P = 0.347$; wind speed: $r = -0.14$, $P = 0.250$, relative humidity: $r = -0.04$, $P = 0.765$, snow cover: $r = -0.11$, $P = 0.375$. Moreover weather characteristics in individual 10-day periods differed significantly among years (Fig. 1).

The effect of weather conditions on the roosting behaviour of Magpies was examined. Controls were carried out for possible serial relationships between the variables using changes in the number of roosting birds and changes in weather parameters between consecutive visits in the roost site.

Based on field observations, it was assumed that the impact of weather on roosting birds was very subtle and occurred over a short time period. Hence, the simultaneous effects of all weather parameters on the number of birds on the day of each visit to the roost were analysed, including interactions among weather parameters using Forward Stepwise Factorial Regression. Data from each period but from different years of the study were considered as independent and were pooled.

Most magpies in the study population started nest building at the beginning of March followed by egg laying in April (Jerzak, 2002). The number of birds visiting the roost thus declines, as territorial pairs begin sleeping in their territories (*pers obs*). Thus, March data was excluded from the analysis of the impact of the weather parameters on the numbers of birds at roost.

Calculations were conducted using STATISTICA for Windows (StatSoft, Inc. 2003). Throughout the test, all means are presented with standard deviation (± *SD*). Statistical methods were used to describe and analyse the data (Sokal & Rohlf, 1995).

The number of birds at roosts changed in a similar fashion to that described for others roosts in Europe (Birkhead, 1991), with a decrease in roosting birds correlated with an increase in nest building activity (*e.g.* Møller, 1985). The number of birds using the two roosts

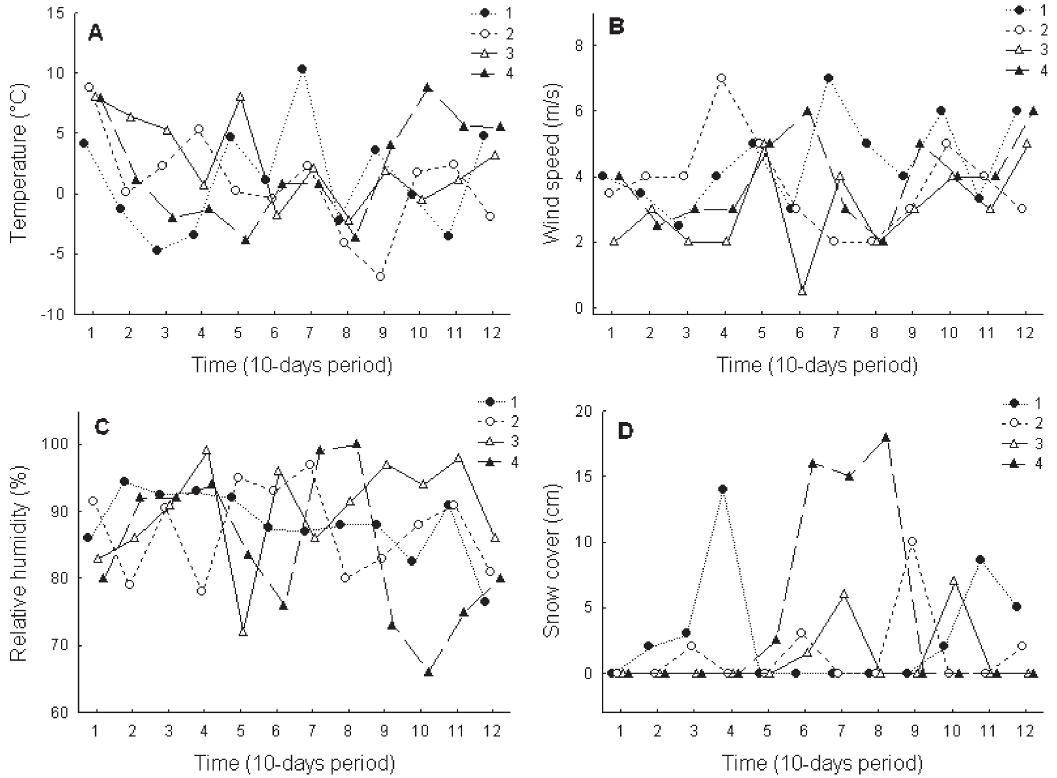

FIG. 1.—Mean daily temperature (A), wind speed (B), relative humidity (C) and snow cover (D) in individual ten-day periods in constitutive years of study in Zielona Góra
[Temperatura media diaria (A), velocidad del viento (B), humedad relativa (C) y cobertura de nieve (D) en periodos individuales de 10 días durante los años del estudio en Zielona Góra.]

differed significantly (Mann-Whitney U-test, $Z = 8.86$, $P < 0.001$). The mean number of birds observed during inspection was 552.4 ± 203.3 and 86.2 ± 36.0 at large and small roosts respectively. Further analysis was performed on the data from the larger roost located in the centre of Zielona Góra. No differences were found in the number of magpies within each year at this roost (Kruskal-Wallis ANOVA, $H_3 = 4.89$, $n = 79$, $P = 0.180$).

The number of birds noted during visits ranged from 45 to 915 birds. We observed the general pattern of these changes. The number of individuals increased with the date of inspection to the second ten-day period in December and remained at this level until the second ten-day period in February. Numbers then decreased to the end of season (Fig. 2).

The possible simultaneous influence of temperature, wind speed, relative humidity and snow cover on the changes in number of birds in the roost was checked. It was found that only wind speed positively affected the changes in the number of roosting birds (forward stepwise factorial regression; model: $R^2 = 0.41$, $F_{1,61} = 42.15$, $P < 0.001$, wind speed = 51.04, $t = 6.49$, $P < 0.001$, Fig. 3).

The roosts in Zielona Góra are among the largest known. The largest magpie roosts tend to be in the urban environment (Jerzak, 2002), cor-

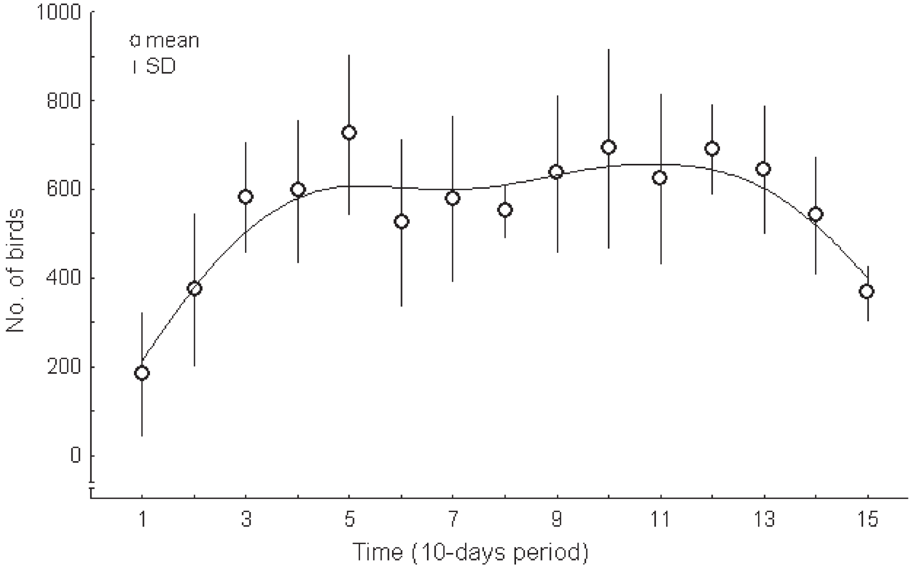

FIG. 2.—The number of Magpies in the communal roost in Zielona Góra, Poland during the winter season (November – March) in 1998-2001. Time is presented in ten-day periods from first of November. Data from all years were pooled.
[Número de Urracas en los dormideros comunales de Zielona Góra, Polonia durante el invierno (noviembre – marzo) en 1998-2001. El tiempo se muestra en periodos de 10 días desde el 1 de noviembre. Los datos de todos los años se tomaron en conjunto.

responding to the highest densities of this species. The largest known European roost is in Lvov, Ukraine, (Bokotei, 1997) with 1.700 birds. This roost is located in small valleys protected from wind and is in small bushes and trees.

Outside the urban environment, the number of magpies at roosts is much lower (Jerzak, 2002). This is probably influenced by the lower densities of magpies in those areas. On the other hand, urban roosts may provide a better microclimate for sleeping, including a higher temperature, less wind and better protection from predators.

In some studies authors suggested that magpies prefer quieter, more sheltered places for roosting. Møller (1985) observed that magpies tend to roost about mid-way up the roost tree, using lower branches on cooler nights and the leeward side during windy weather. Reebs (1986) found that wind speed was a significant predictor of the time of arrival at the roost. Magpies tended to go to roost earlier on very windy days. Reebs (1987) found that magpies roosted in conifers and perched beside the trunk on the lowest leaf-bearing branches immediately below the canopy. It was also found that when night-time temperatures were around -20ºC, that magpies saved about 8% of their energy by roosting in dense conifers out of the wind (Mugaas & King, 1981). Bosch & Havelka (1998), on the basis of telemetric studies, suggested that the optimal place for magpies' winter roost is the area on the suburb of towns surrounded by an open landscape.

This study showed that climatic conditions alone could not account for communal roosting, however magpies responded to weather, especially to wind speed. This was in agreement with that found by Møller (1985). A pos-

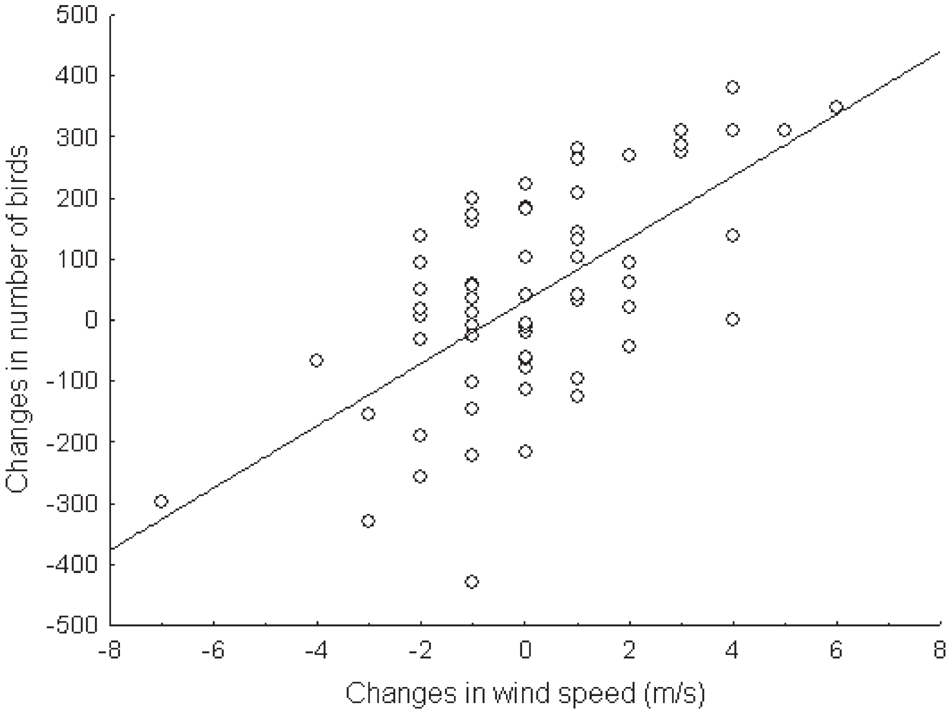

FIG. 3.—Correlation between changes in number of roosting Magpies and changes in wind speed between consecutive visits in the roost; $R^2 = 0.4$, $n = 63$, $P < 0.001$.
[Correlación entre cambios en el número de Urracas en el dormidero y los cambios en la velocidad del viento en visitas consecutivas al dormidero.]

sible explanation for this mechanism is that on windy days magpies leave small temporary roosts and congregate at larger, quieter roosts in the town centres. This is in agreement with the findings of Ponz & Manros (2000), who found that magpies leave the roost in farmland on cold days with a corresponding increase in numbers recorded in the town of Pitarque.

RESUMEN.—*El número de individuos anotados durante las visitas estuvo comprendido entre 45 y 915. Observamos el patrón general de esos cambios. El número de individuos incrementó con el día de inspección al segundo periodo de 10 días en diciembre, y se mantuvo a ese nivel hasta el segundo periodo de 10 días en febrero. El número disminuyó hasta el final de la estación. Examinamos la posible influencia de la temperatura, velocidad del viento y humedad relativa en el número de individuos en el dormidero. Encontramos que la velocidad del viento afectó positivamente sobre el número de individuos en el dormidero. Al realizar un análisis por separado utilizando la media de los parámetros climáticos en el día de inspección y en los dos siguientes, encontramos que la velocidad del viento influyó de forma significativa sobre el número de individuos en el dormidero. Según otras fuentes, fuera del ambiente urbano el número de urracas en el dormidero es más bajo. Lo que probablemente se deba a las densidades más bajas*

de urracas en esas áreas. Por otro lado, los dormideros urbanos deben proporcionar un mejor microclima, incluyendo una temperatura más elevada, menos viento y además menos depredadores. Nuestro estudio indica que las zonas de dormideros de las urracas responden a las condiciones climáticas, en lo que se refiere a la velocidad del viento. Los resultados coinciden con los de otros autores. Una posible explicación para este mecanismo, es que en días de viento las urracas abandonan los dormideros temporales más pequeños para congregarse en dormideros más grandes y tranquilos en el centro de las ciudades. Nuestros resultados coinciden con los de otros autores que encontraron que las urracas abandonan los dormideros de las zonas cultivadas durante los días fríos para desplazarse a las ciudades.

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