

## **Magpie *Pica pica* and Hooded Crow *Corvus corone cornix* flock structure in relation to their distance from trees**

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Various aspects of the biology of the Magpie *Pica pica* and the Hooded Crow *Corvus corone cornix* have been compared: foraging (Fasola et al. 1986, Holioak 1968, Lockie 1956), skill in finding and recovering food (Waite 1985), distribution and breeding sites (Fasola & Bricchetti 1983) and choice of foraging sites and winter feeding strategies (Loman 1980, Waite 1984a). In Denmark Moller (1983) noticed the Magpie's greater tendency to stay close to trees as compared to the Hooded Crow. In this study I indicate some differences in the flock size and flock structure of the two species in relation to their distance from trees during winter in a mediterranean area

**STUDY AREA AND METHODS** - Data were collected in World Wildlife Fund "Bosco di Palo" Natural Oasis, Ladispoli (Rome, 41°56'N-12°05'E). Observation were made from October to March 1984-85 and 1985-86 in 15 ha of grassland, bordered to the East by a Turkey Oak *Quercus cerris* wood, to the West by the sea and to the North and South by farm-tracks. Because of the large scale erosion near the sea, the dune belt is missing and the beach is less than 10 m wide, I did not take observations made in this area into account. I divided my observations regularly throughout the day and in all climatic conditions. On every occasion I observed one of the above-mentioned species during its trophic activity I noticed whether it was alone, in a monospecific flock (no. individuals  $\geq 2$ ) or in a heterospecific flock and I reckoned the distance from the trees of the nearest wood in four distance classes. between 0 and 10 m, between 10 and 50 m, between 50 and 100 m, and over 100 m. Since there were no significant differences between the data of the two years and those of the single months, I cumulated them. As regards the autumn months preceding October I have no data since the meadows were abandoned due to drought; in the spring months following March the meadows were also abandoned because the grass was too high. The two species breed in the wood bordering the study area with a density of 0.62 pairs every 10 ha (Fraticelli & Sarrocco 1984). The study area was frequented, as a foraging site, by the Jackdaw *Corvus monedula* also, but the observations of this species were too irregular for the data to be elaborated.

**RESULTS AND DISCUSSION** - The frequency of individuals feeding alone, in monospecific or in heterospecific flocks (Tab. I) differed significantly in the two species ( $\chi^2 = 23.94$ ;  $P < 0.01$ ), they prefer feeding in monospecific flocks. In Denmark Moller (1983) found, as I did, that the Magpie prefers to gather in flocks and that the Hooded Crow has a lesser tendency to do so. With relation to the frequency of individuals feeding alone, in monospecific or heterospecific flocks in relation to the distance from trees, (Tab. II) the Magpie shows significant statistical differences among the four categories, between isolated individuals and monospecific flocks ( $\chi^2 = 21.56$ ;  $P < 0.001$ ), between isolated individuals and

TABLE I. The percentage of Magpie and Hooded Crow observed alone, in monospecific and heterospecific flocks, and their distribution in the four categories of distance from the trees, expressed in meters.

	No. individuals	alone	monospecific	heterospecific	Distance categories			
					<10	10-50	50-100	>100
Magpie	432	22.4	65.1	12.5	27.8	30.2	15.3	26.6
Hooded Crow	520	10.8	75.4	13.8	0.6	8.8	31.6	59.0

TABLE II. The percentage of Magpie and Hooded Crow observed alone, in monospecific and heterospecific flocks, distributed in the four categories of distance from the trees expressed in meters, and the average number of individuals per flock.

		No. observations	Distance categories				No. individuals	
			<10	10-50	50-100	>100	mean±s.d.	range
Magpie	alone	97	56.7	22.7	7.2	13.4		
	monospecific	92	23.9	34.8	16.3	25.0	3.05±1.89	2-12
	heterospecific	22		13.6	50.0	36.4	2.45±2.26	1-11
	total	211	36.5	27.0	15.6	20.9	1.98±1.70	
Hooded Crow	alone	56	1.8	12.5	33.9	51.8		
	monospecific	151	0.7	7.3	33.1	58.9	2.61±1.16	2-7
	heterospecific	30		10.0	33.3	56.7	2.39±1.15	1-5
	total	237	0.8	8.9	33.3	57.0	2.19±1.21	

heterospecific flocks ( $\chi^2 = 40.23$ ;  $P < 0.001$ ), and between the two types of flocks ( $\chi^2 = 17.53$ ;  $P < 0.001$ ).

In the Hooded Crow there is no significant difference. When the two species are compared it is found that significant statistical differences exist within the four categories in both the observations ( $\chi^2 = 151.98$ ;  $P < 0.001$ ) (Tab. II) and the individuals ( $\chi^2 = 276.57$ ;  $P < 0.001$ ) (Tab. I). When the Magpie feeds alone it prefers to stay near the trees, when feeding in monospecific flocks it is uniformly distributed among the four categories, while in heterospecific flocks it leaves the trees preferring the distance category between 50 and 100 m. On the whole there is a relatively regular distribution into four categories both of the individuals and of the number of observations made (Tab. I). Moller (1983) found that in October, November and December 50% of Magpies stand less than 100 m from trees but he does not report whether they are in flocks or not. In Holland, Bossema et al. (1986) found that the Magpie prefers open areas and the edges of woodland, but whether or not they are in flocks is not considered. The Hooded Crow prefers to stay at a distance from the trees, as is shown by both the numbers of observations made and the numbers of individuals observed (Tab. I). Moller (1983) found that over the year more than 50% of Hooded Crows forage at a distance of over 100 m from trees. Comparing the size of the flocks with the classes of distance from the trees and excluding the heterospecific flocks (Fig. 1) a significant positive linear correlation

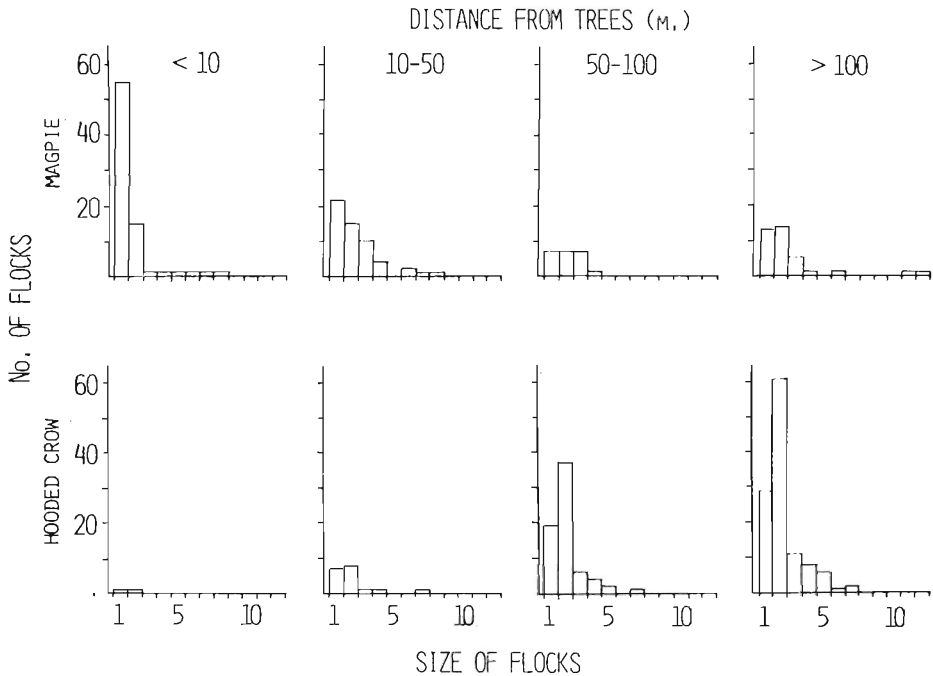


FIGURE 1. Histograms illustrating the frequency size of the flocks, excluding heterospecific flocks, of the Magpie and Hooded Crow distributed in the four categories of distance from the trees, expressed in meters.

for the Magpie ( $r_{187} = 0.20$ ;  $P < 0.01$ ) and a non-significant correlation for the Hooded Crow ( $r_{205} = 0.10$ ) are shown.

No significant differences were found either in the number of Magpie and Hooded Crow individuals which feed in the two types of flock, or in the average size of the flocks of the two species (Tab. II). The average number of Magpie individuals in a flock is similar to the number reported for the winter by Loman (1980) in Sweden but is lower than that reported by Birkhead et al. (1986) in England, and does not reach the highest values reported by Holyoak (1974) in England. This may be because the study area is mainly frequented by territorial individuals whose tendency to gather in flocks is less than in non-territorial individuals (Birkhead et al. 1986). The low values found for Hooded Crow flock size in comparison with other European areas (Loman 1980, 1985, Moller 1983) can be explained by the fact that this area is not particularly interesting for feeding. In fact I have observed flocks composed of up to 42 individuals, along the beach bordering on the study area, feeding on the remains of dead organism washed up by the sea. Another explanation could be that the area is mainly frequented by territorial adults which, as reported by Loman (1985) in Sweden, form smaller flocks than the non territorial juveniles. Of the 22 cases of Magpies in heterospecific flocks, 45.5% were with Hooded Crows, 27.2% with Jackdaws and 27.2% with both species. Of the 30 cases of Hooded Crows in heterospecific flocks, 33.3% were with Magpies, 46.7% with Jackdaws and 20.0% with both species. Of the 37 cases of Jackdaws,

16.2% were with the Magpie, 37.9% with the Hooded Crow, 16.2% with both species, and 29.7% in monospecific flocks. Considering that Magpie is the crow species which has the least tendency to form heterospecific flocks with other species, that Magpie-Hooded Crow heterospecific flocks are the least common (Loman 1980) and that the Hooded Crow overcomes the Magpie in the struggles for food (Bossemma et al. 1976, 1986, Vines 1981, Waite 1984b) and the highest number of attacks is in fact reported in winter (Moller 1983), the fact that the Magpie joins the Hooded Crow when they are far from the trees is likely to mean that the disadvantages of interspecific competition are lower than those deriving from an intraspecific competition in the limited area near the trees. It would be interesting to verify whether the Magpie spends less time checking for predators than in foraging when in the company of other species, and whether distance from trees has some influence on this as Caraco et al. (1980) have found in *Junco phaenotus* and Barnard (1980) in *Passer domesticus*.

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**RIASSUNTO** - *Struttura dello stormo nella Gazza Pica pica e nella Cornacchia grigia Corvus corone cornix in rapporto alla distanza dagli alberi.*

- E' stata studiata la dimensione dello stormo e la sua struttura in rapporto a quattro classi di distanza dagli alberi per la Gazza e la Cornacchia grigia nel Bosco di Palo (Ladispoli, Roma).  
 - Tutte e due le specie preferiscono alimentarsi in stormi monospecifici.  
 - La Gazza preferisce, quando si alimenta da sola, stare in prossimità degli alberi; quando si alimenta in stormi monospecifici distribuirsi in modo uniforme nelle quattro categorie di distanza dagli alberi; quando si alimenta in stormi eterospecifici allontanarsi dagli alberi.  
 - La Cornacchia grigia preferisce sempre tenersi lontana dagli alberi.  
 - Nella Gazza vi è la tendenza a formare stormi sempre più grandi via via che si allontana dagli alberi.  
 - La Gazza, quando si alimenta in zone lontane dagli alberi, tende ad associarsi alla Cornacchia grigia, nonostante questa sia una specie socialmente dominante su di lei, forse perché gli svantaggi di una competizione interspecifica sono minori di quelli derivanti dalla competizione intraspecifica nel ristretto spazio in prossimità degli alberi.

FIG. 1. Frequenza delle dimensioni degli stormi in quattro categorie di distanza dagli alberi (in m).

TAB. I. Percentuale di individui di Gazza e di Cornacchia grigia isolati, in stormi monospecifici ed in stormi eterospecifici e loro distribuzione in quattro categorie di distanza (in m) dagli alberi.

TAB. II. Percentuale di osservazioni di Gazza e di Cornacchia grigia in individui isolati, in stormi monospecifici ed in stormi eterospecifici in quattro categorie di distanza (in m) dagli alberi e numero medio di individui per stormo.

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