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Notas Breves

THE NESLING DIET OF THE IBERIAN AZURE-WINGED MAGPIE *CYANOPICA CYANUS COOKI* IN SOUTHEASTERN PORTUGAL

DIETA DE LOS POLLOS DEL RABILARGO *CYANOPICA CYANUS COOKI* EN EL SURESTE DE PORTUGAL

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The Azure-winged Magpie *Cyanopica cyanus* is a small sized corvid, weighing around 70 g. This species has a remarkable distribution, occurring only in eastern Asia (China, Korea, Mongolia, Japan and Russia) and in south-western Europe, in the Iberian Peninsula (Sacarrão, 1974; Cramp & Perrins, 1994). It is very gregarious, sedentary and breeds colonially and cooperatively, with helpers-at-the-nest, both in the eastern (Komeda *et al*., 1987) and western (Valencia *et al*., 2000; Canário & Soler, *pers. obs*.) portions of its distribution range.

It is thought that insects are the main element of its diet. However, this species also feeds on other invertebrates, seeds, fruits and more rarely on eggs, small vertebrates (amphibians, reptiles, small mammals and bird nestlings), human waste and even carrion (Cramp & Perrins, 1994; Cónsul & Alvarez, 1978; Alvarez & Aguilera, 1988; Rodríguez, 1993). The nestling diet of this species has been studied only in the eastern portion of its distribution range. As compared with the adult diet, invertebrates remain the most consumed prey, while vegetable items are less important (Hosono, 1966; Cramp & Perrins, 1994).

Because of local superstitions concerning the Azure-winged Magpie's feeding habits, farmers, gamekeepers and hunters have traditionally persecuted this species in Portugal. Farmers argue that this species damages several crops, while hunters claim that it feeds on the nestlings of some game species, namely the Red-legged Partridge *Alectoris rufa*. This fact, together with the shortage of published data on the feeding habits of Azure-winged Magpies in the Iberian Peninsula, emphasize the importance of the study of this species' diet. Here we focus on the nestlings' diet.

This study was carried out in May and June 1997 in an open Holm oak montado (*Quercus ilex*) used as a pastureland for cattle near Barrancos in south-eastern Portugal (38º08' N, 7º10' W). The tree density is around 30 trees/ha and the understorey is rather clear on account of heavy grazing (less than 5% shrub cover). The climate is typically Mediterranean, with dry-hot summers and mild-wet winters. Diet samples were obtained using the «ligature method», which consists in applying a constricting band around the neck of the chicks of nidicolous birds with sufficient pressure on the proventriculous to prevent them from swallowing food items brought to the nest by the parents, but loose enough to avoid strangling (Kluijver, 1933). In our study, the ligature was a plastic electric cable tie as described by Mellott & Woods (1993). The ligature remained around the nestlings' neck for a period of time ranging between 60 and 225 minutes (125 minutes on average) after which food items were removed. The nestlings from which food was taken were compensated with insectivorous bird ration, consisting of insects and seeds. Food was collected from 16 broods (41 nestlings) with ages ranging from 4 to 11 days.

Collected items were preserved in a solution of ethanol (70 %) with glycerine and later on

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identified in the laboratory, whenever possible, to the family level. For the biomass estimates (mg dry weight), food samples were placed in an oven at 60º C for 48h and later all items of each prey type were weighed on a precision balance (0.0001g).

To analyse the data, we calculated the percentage of occurrence (PO) as a measure of the regularity of the appearance of a prey type (number of occurrences x 100 / total number of broods sampled); the relative frequency (RF), which relates the number of occurrences of a food type with the total number of identified prey (number of occurrences x 100 / total number of food items); and the biomass percent (BP) (prey biomass x 100 / total biomass consumed).

Out of the 443 prey items that were analysed, 441 (99.6%) were terrestrial invertebrates. Insects were by far the main prey, comprising 88.7% of the items and 85.2% of the biomass. Arachnids (RF = 9.29%, BP = 12.16%), Gastropods (RF = 0.86%, BP = 1.58 %) and Chilopods (RF = 0.22%, BP = 0.08 %) were the main secondary prey. The only vertebrate prey recorded were one bird nestling and eggshell fragments, comprising less than 1% of the total biomass. Small amounts of vegetable matter were found sporadically, always together with phytophagous insect prey. It was then assumed that these plant remains were unintentionally collected by Azure-winged magpies during the hunting of these invertebrates. This assumption is based on the characteristics of the plant material collected (scarce and of poor nutritive value), that is indicative of non-directed predation, as well as on the ecology of the insect prey present in the same sample (fast-moving phytophagous insects that feed on herbaceous plant species, such as grasshoppers, Heteropterans and Homopterans). For this reason, vegetable matter was not considered as part of the diet (Table 1).

Among the insects, Lepidoptera larvae and pupae were the most important prey in terms of biomass (BP = 41.60%). Other important food items were Coleoptera, especially Tenebrionidae and Melolonthidae, and Arachnida (BP = 13.89% and BP = 12.16%, respectively; Table 1). Cicadellidae (Homoptera) were present in only two broods, but always in very large numbers (RF = 24.62%). Although these were by far the most abundantly taken prey, they comprised only 6.13% of the biomass. The food items that were more regularly given to the nestlings were Arachnids (PO = 81.25 %), Coleopterans (PO = 81.25%), especially Tenebrionidae, Scarabeidae and Melolonthidae, and Hymenopterans (PO = 75.00%), mainly Formicidae (Table 1).

As our results show, Azure-winged Magpies are insectivorous when feeding nestlings, in our area. This species searches mainly for soil dwelling and phytophagous invertebrates. Bird nest predation seems to be rare in the study population.

Hosono's data (1966) are similar to ours since, also in Japan, the most frequent prey were invertebrates (at least 75.0% of the food items). However, the Japanese populations of Azure-winged Magpie preyed more intensely on bird nestlings (at least 9.3% of the food items) than their Iberian counterparts. Vegetable items, namely berries, played also an important role as a food source (8.6% of total food items) for the Japanese populations. In Japan the group of invertebrates more frequently preyed on was Dipterans, which were rarely taken in Portugal. The other main prey, Lepidopterans, Coleopterans, Orthopterans and Arachnids, were important prey items for both populations. Ants were actively collected in Portugal, but were absent from the diet of the Japanese population (Hosono, 1966).

The main difference between the diet of nestlings and the diet of adults during the non-breeding season is the reduced importance of vegetable items in the nestlings' diet. In winter, adults consume large quantities of plant matter, reaching a volume of 41% and 50% of total biomass in southern Spain (Cónsul & Alvarez, 1978; Alvarez & Aguilera, 1988).

Because fruits and other plant food sources are rare during the breeding season, and animal prey are an important protein source for nestling growth (O'Connor, 1984), it is thus expected that parents concentrate their efforts in the search for animals in detriment of vegetable food. Since nest predation is the main cause of breeding failure in this species (de la Cruz *et al*., 1991; Muñoz-Pulido *et al*., 1991), there is probably a strong selection pressure towards a short nest permanence which is favoured by a fast nestling growth (Lack 1968; Bosque & Bosque, 1995; Gebhardt-Heinrich & Richner, 1998).

TABLE 1

Relative frequency (RF), percentage of occurrence (PO) and percentage of biomass (PB) of the food items consumed by Azure-winged Magpie nestlings (n.i. = non-identified).
[Frecuencia relativa (RF), porcentaje de ocurrencia (PO) y porcentaje de la biomasa (PB) de los tipos de alimento consumidos por los pollos de Rabilargo (n.i. = no identificado).]

Class	Order	Family	RF (n = 443)	PO (n = 16)	PB (n = 443)
Insecta	Orthoptera	Pamphagidae	0.43	12.50	0.32
		Acrididae	1.94	31.25	3.09
		n.i.	0.22	6.25	0.32
	Mantodea	Mantidae	0.22	6.25	0.48
	Dermaptera	Forficulidae	0.65	12.50	0.95
	Homoptera	Fulgoridae	0.22	6.25	0.08
		Flatidae	0.22	6.25	0.08
		Issidae	3.24	18.75	0.71
		Cicadellidae	24.62	12.50	6.13
	Heteroptera	Coreidae	1.30	25.00	0.67
		Myridae	0.65	18.75	0.40
		Scutelleridae	0.22	6.25	0.08
		Aradidae	0.22	6.25	0.08
		Pentatomidae	0.43	12.50	0.24
		Cydnidae	0.22	18.75	0.68
		Saldidae	0.43	6.25	0.79
		Nabidae	0.22	6.25	0.08
		n.i.	0.43	12.50	0.24
	Coleoptera	Tenebrionidae	1.73	37.5	4.20
		Buprestidae	0.22	6.25	0.16
		Carabidae	0.22	6.25	0.40
		Scarabeidae	1.51	37.50	0.83
		Melolonthidae	2.16	37.50	4.18
		Rutelidae	0.22	6.25	0.48
		Elateridae	1.08	25.00	0.79
		n.i.	0.65	12.50	2.85
	Diptera	Asilidae	0.86	12.5	0.63
		Tachinidae	0.65	6.25	0.16
		Calliphoridae	0.22	6.25	0.08
		n.i.	0.22	6.25	1.16
	Lepidoptera	n.i. adult	1.51	31.25	0.83
		n.i. larvae	16.41	12.50	41.60
	Hymenoptera	Formicidae	11.45	75.00	5.84
		Vespidae	0.22	6.25	0.16
		Sphecidae	0.43	12.50	0.24
		Apidae	0.22	6.25	0.13
	n.i. Pupae and larvae		13.33	37.50	6.12
Arachnida	Araneae	n.i.	7.99	81.25	11.93
	Soliphuga	n.i.	1.30	25.00	0.24
Chilopoda	n.i.	n.i.	0.22	6.25	0.08
Gastropoda	n.i.	n.i.	0.86	12.50	1.58
Aves	Nestling	n.i.	0.22	6.25	0.95
	Egg	n.i.	0.22	6.25	—

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