

SIGNIFICANCE OF ANTS IN THE DIET OF INSECTIVOROUS BIRDS IN SOUTHERN SPANISH MEDITERRANEAN HABITATS

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INTRODUCTION

Despite their ubiquity in ecosystems, worker ants are as a rule neglected as prey by most small insectivorous birds (e. g., POULSEN, 1956). Unpalatability due to the presence of formic acid in ant bodies, along with presumably low nutritive profitability, must be among the principal causes for this general trend. There are, however, some bird species specializing on ant-feeding such as for instance, in Europe, *Picus viridis*, *Jynx torquilla* and *Pyrhocorax pyrrhocorax* (GEROUDET, 1973; COWDY, 1973), suggesting that under certain circumstances ant-feeding may involve among temperate birds. These species possess morphological and/or behavioural adaptations which apparently render profitable a diet composed almost exclusively of ants during certain periods of the yearly cycle. As noticeable exceptions to the general rule of worker ants neglecting by small birds, I have previously documented for two ant-unspecialized species (*Erithacus rubecula* and *Phoenicurus ochruros*) an important role of worker ants in their autumn-winter diet in southern Spain (HERRERA, 1977 a, 1978). In this note I present new information related to four additional species, namely *Saxicola torquata*, *Motacilla alba*, *Ficedula hypoleuca* and *Upupa epops*, which also suggests a central role of ants in the diet of small insectivorous birds during autumn-winter in mediterranean habitats of southern Spain.

STUDY AREA

Data presented here come from the analysis of gizzard contents from birds collected in several localities of western Andalusia in the autumn-winter period of years 1974-1977. Birds came from a variety of habitat types, including oak woodlands, agricultural land and fairly disturbed mediterranean scrubland. Except for *F. hypoleuca*, which were migrant birds collected during their autumn passage period, individuals of the remaining species were winter residents in the area.

RESULTS AND DISCUSSION

The proportion of ants in the total invertebrate prey items recorded is shown in table I. All species forage regularly on the ground, either by means of sustained walking or by hawking from an elevated perch, so frequent contacts

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TABLE I

Significance of ants in the autumn-winter diet of six bird species in western Andalusia, southern Spain. Data for *E. rubecula* and *P. ochruros* have been drawn from Herrera (1977a, 1978).
Significado de las hormigas en la dieta de otoño-invierno de seis especies de aves en Andalucía occidental, Sur de España. Los datos para E. rubecula y P. ochruros han sido obtenidos de Herrera (1977a, 1978)

| | <i>Erithacus rubecula</i> | <i>Phoenicurus ochruros</i> | <i>Saxicola torquata</i> | <i>Motacilla alba</i> | <i>Ficedula hypoleuca</i> | <i>Upupa epops</i> |
|--|-------------------------------|---------------------------------|------------------------------|---------------------------|-------------------------------|------------------------|
| Number of gizzards examined (Número de estómagos examinados) | 110 | 32 | 14 | 14 | 13 | 4 |
| Fraction containing ants (%) (Porcentaje conteniendo hormigas) | 92,7 | 89,7 | 92,8 | 100 | 92,3 | 75,0 |
| Total invertebrate prey recorded (Total de invertebrados registrados) | 2.216 | 709 | 265 | 433 | 560 | 92 |
| % Worker ants (Porcentaje de hormigas obreras) | 73,7 | 37,5 | 36,6 | 35,3 | 43,5 | 66,3 |
| % Winged ants (Porcentaje de hormigas aladas) | 1,9 | 17,3 | 17,7 | 37,6 | 43,4 | 0 |
| Total ants (Total de hormigas) | 75,6 | 54,8 | 54,3 | 73,0 | 90,9 | 66,3 |

with ants are to be expected. The proportion of ants in the invertebrate fraction of the diet varies from 54.3% (*S. torquata*) to 90.9% (*F. hypoleuca*), with ants representing more than half of total invertebrate prey in all cases. Ants were not identified to species, but large harvester ants of the genus *Messor* were very commonly found in the gizzards.

These data clearly demonstrate that all species ingest ants quite frequently and, presumably, that they rely heavily on them for food. Disregarding winged ants, which are a prey type usually ingested by birds wherever they find them (e. g., THIOLLAY, 1970), the importance of worker ants alone ranges between 35.3% (*M. alba*) and 73.7% (*E. rubecula*), demonstrating that this prey type, usually neglected elsewhere, constitutes a prominent fraction of the diet of these species in southern Spain. Frequency of occurrence of ants in stomachs is also very high (from 75% to 100%, mostly around 90%), revealing that the ant-eating habit is widespread among individuals of all species.

The relative importance of winged and worker ants varies among bird species. They have about the same significance in *M. alba* and *F. hypoleuca*, whereas workers predominate in the remaining species. Winged ants are most frequent in the diets of *M. alba* and *F. hypoleuca*, fairly common in that of *S. torquata* and *P. ochruros*, and virtually absent from the diets of *E. rubecula* and *U. epops*. Essentially, this reflects differing hunting methods, in particular the frequency of sallying flights to seize flying prey.

On the basis of information from insect trapping yields in oak woodlands, I have argued elsewhere (HERRERA, 1977 a, 1978) that consumption of worker

ants by *E. rubecula* and *P. ochruros* in autumn-winter originates from the relative scarcity of alternative invertebrate prey to the birds in that mediterranean habitat. This is also supported by comparing the significance of ants in the diet of the same species in autumn-winter and spring, when invertebrate prey are presumably most abundant. This kind of information is available only for *S. torquata* and *U. epops*, since the remaining four species dealt with here are mainly autumn and/or winter visitors in the area. Not a single ant was found among 89 invertebrate prey found in 8 gizzards from *U. epops* collected in early spring, and only 3 ants (8.6%) appeared among 35 prey found in three spring stomachs from *S. torquata*. This suggests that as soon as new prey types become available, autumn-winter ant-eaters shift their diets to more profitable prey items and discontinue ant ingestion. This phenomenon is also exemplified by comparing size frequency distributions for prey of *U. epops* in autumn-winter and spring (fig. 1). Modal class of prey length in the former season (in which ants predominate) is 10 mm. smaller than in spring, and mean prey length is nearly 12 mm. larger in the latter. This reveals that the birds are feeding on

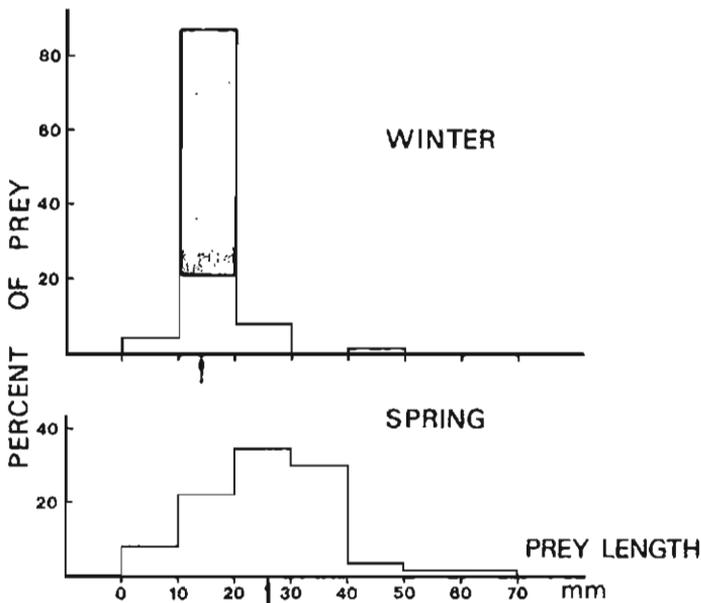


FIG. 1.—Frequency distributions of length of prey found in *Upupa epops* stomachs in winter ($n=92$ prey items) and spring ($n=89$). The shaded portion in the upper histogram represents the fraction constituted by ants. Arrows denote mean prey length in both seasons. The winter diet, dominated by worker ants, is characterized also by much smaller items than the spring diet.

Distribución de la longitud de las presas encontradas en estómagos de Upupa epops en invierno ($n=92$ presas) y primavera ($n=89$). La parte sombreada en el histograma superior representa a la fracción constituida por hormigas. Las flechas indican la longitud media de las presas en ambas estaciones. La dieta invernal, dominada por las hormigas, está caracterizada también por presas más pequeñas que la dieta primaveral.

much less rewarding prey during the autumn-winter period. There exists some previous information related to ant-feeding by *E. rubecula* and *P. ochruros* in laboratory conditions (several authors in POULSEN, 1956, pp. 289-290), and it also appears to support the hypothesis that these species eat ants only when subject to a shortage of alternative insect food (POULSEN, 1956).

In addition to a scarcity of alternative prey types, widespread ant consumption by ground-feeding birds may also have to do with a likely greater abundance of ants in southern Spanish mediterranean habitats in relation to more northern European areas. I do not know of any absolute estimate of ant abundance in southern European mediterranean habitats, so comparisons with other areas are not possible. Results of insect trapping in oak woodlands reveal that ants are the most conspicuous and abundant ground-surface-dwelling arthropods during several months of the year, from early summer to early autumn (corresponding to the dry season), and still continue to be fairly abundant throughout the winter (HERRERA, 1977 b). It is well known that ants are conspicuous components of most arid and semi-arid environments, such as deserts and savannas (e. g., GILLON & GILLON, 1973; LAMOTTE, 1977; BROWN *et al.*, 1979). The reproductive strategies of most arid-zone plants, based on an ephemeral life-cycle and the production of large numbers of seeds following the rains, have apparently favoured the development of rich and abundant harvester ants faunas in these habitats (BROWN *et al.*, 1979). In most present day, fairly disturbed southern Spanish habitats, annual herbs are a prominent feature, and savanna-like habitats resulting from deforestation have replaced the natural mediterranean scrubland and become widespread vegetational formations (e. g., TOMASELLI, 1976; HERRERA, 1977 b), so it would be not unexpected to find abnormally high ant densities in these areas. It is thus tempting to speculate that habitat deterioration in southern Spain during the last two thousand years may be responsible to certain extent for the evolution of the ant-eating habit among ground-feeding birds reported in the present note.

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RESUMEN

Significado de las hormigas en la dieta de las aves insectívoras de los hábitats del Mediterráneo meridional español

Las hormigas obreras son habitualmente ignoradas como presa por la mayoría de las pequeñas aves insectívoras. Sin embargo, seis especies de pequeños insectívoros (*Erithacus rubecula*, *Phoenicurus ochruros*, *Saxicola torquata*, *Motacilla alba*, *Ficedula hypoleuca*, *Upupa epops*) desarrollan un elevado consumo de hormigas durante otoño-invierno en hábitats mediterráneos del sur de España. Este hecho debe relacionarse con la escasez de otras presas alternativas durante ese período, así como con una probable mayor abundancia de hormigas en hábitats alterados y deforestados.

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