PREY SIZE SELECTION BY LAPWINGS IN LAPWING/GULL ASSOCIATIONS

by

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INTRODUCTION

Birds which feed in flocks appear to benefit in a number of ways. In particular they may tend to feed on richer food supplies (KREBS, 1974; Goss-CUSTARD, 1970; BARNARD, 1980a), cash in on local information about the type and whereabouts of food (KREBS et al., 1972; KREBS, 1973; RUBENSTEIN et al., 1977; LAZARUS, 1979a; BARNARD & SIBLY, in press), devote more time to feeding (POWELL, 1974; CARACO, 1979a, b; BARNARD, 1980b) and/or gain protection from predators (PAGE & WHITACRE, 1975; KENWARD, 1978; LAZARUS, 1979b; BARNARD, 1979, 1980; CARACO et al., 1980). In many cases these benefits arise from changes in the way birds allocate time to each of the activities they perform during feeding so that more time can be spent looking for or processing food. In this paper we examine another way in which being in a flock may increase a bird’s feeding efficiency as a result of changes in time budgeting.

It is now well known that predators can select prey so as to maximize their net rate of energy intake during foraging (KREBS et al., 1977; Goss-CUSTARD, 1977; KREBS, 1978; ERICHSEN et al., 1980; HOUSTON et al., 1980). In this study we look at how flocking may influence prey size selection by birds and at the relative importance of flock size and other environmental variables. We also examine the relationship between changes in prey size selection and changes in individual time budgets to see how the way a bird divides up its time might influence its feeding efficiency. Finally we look at the effect of kleptoparasites (see BROCKMANN &
Barnard, 1979) within the flock on time budgeting and prey size selection. Kleptoparasites may alter the relative profitability of prey types available to a bird or penalize behaviour which generates information about having found food.

**SPECIES OBSERVED AND STUDY AREA**

The species we studied was the lapwing (*Vanellus vanellus*). Lapwings and other Charadriiformes in Britain commonly feed in variable sized flocks during the winter, often on agricultural meadowland and pasture (see also Kallander, 1977, 1979; Fuller & Youngman, 1979). We observed birds feeding on pasture around Lodge Farm, Wysall, about 10 miles southeast of Nottingham. Owing to the area being on Boulder Clay deposits, the fields (mean area = 2.84 ± 0.48 ha., range = 1.17-6.80 ha.) were poorly drained and often during the period of observation (November 1979 to March 1980), waterlogged. By direct observation of feeding birds and by sampling species present in and on the turf (see later), it was clear that almost the only prey available to birds in the area were various species of oligochaete worm. As far as we could tell, birds took only earthworms (although it was difficult to be certain with very small (<16 mm) items and earthworms constituted 99% of the species found in the turf, the remainder being the larvae of various coleopterans and dipteran flies. Except for two or three horses in one field, no domestic livestock was present in the study area during the observation period.

The lapwing flocks in the area (as usually also in other areas) were commonly joined by black-headed gulls (*Larus ridibundus*). The gulls, which were present in variable numbers within flocks (range = 1-43 per flock), behaved as pure kleptoparasites once they joined lapwings even though they were capable of finding worms in the ground in the absence of lapwings (C.J.B. unpubl. obs.). Kallander (1977, 1979) has studied similar relationships between lapwings and black-headed gulls in Sweden and found that gulls could obtain well in excess of their daily energy requirements solely by stealing worms from lapwings. Characteristically, gulls in our area stood immobile at some point within the flock except when snatching food or moving to another vantage point. Attacks on lapwings often resulted in protracted aerial chases until prey items were dropped or the attacked lapwing left the flock. Kallander (1977) provides an excellent, detailed discussion of the feeding relationship between gulls and lapwings.

**METHODS**

Flocks of lapwings were located opportunistically during the observation period. Birds were easily disturbed, sometimes with flight distances (see Owens, 1977; Barnard, 1980b) in excess of 100 m, and tended to leave the area completely if alarmed. Once a flock was located, arbitrarily chosen birds were observed through a x 15- x 60 HT8 telescope mounted on a tripod and their sequences of behaviour dictated into a Uher 4000 report tape recorder. Recorded sequences were later transcribed on the computer to obtain the frequency of performance and the time spent in each activity. Most birds were observed until they left or were obscured from view by grass or undulations in the ground, (mean duration of observation = 154.8 ± 20.4 s, range = 39.5-399.4 s). However, birds for which turf samples were taken were observed for shorter periods (see later). During observation, four main types of behaviour could be distinguished; pecking, stepping, scanning and crouching. **Pecking** is more or less self-explanatory; birds moved with a series of short, rapid stepping actions with the head held erect and each step measuring about 3.5 cm. **Pecking** describes all the actions associated with catching and handling prey once the bird first pecked at the ground. Pecking therefore includes pulling a worm out of the ground as well as mandibulation and swallowing. **Crouching** refers to a posture sometimes taken up by a bird immediately before pecking, although pecking did not always follow. The bird