COSTS AND BENEFITS OF SINGLE AND MIXED SPECIES FLOCKING IN FIELDFARES (TURDUS PILARIS) AND REDWINGS (T. ILIACUS)

by

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(With 4 Figures)

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Introduction

A considerable amount is now known about the factors selecting for flocking behaviour in bird species. For instance, flocking may enhance feeding efficiency (e.g. Krebs et al., 1972; Krebs, 1974; Powell, 1974; Barnard, 1980a), predator avoidance (e.g. Siegfried & Underhill, 1975; Kenward, 1978; Lazarus, 1979; Barnard, 1980a), thermal regulation (Brenner, 1965), and breeding success (e.g. Emlen, 1978). Each of these effects can be brought about in a number of different ways (e.g. Lazarus, 1972, 1978, 1979; Krebs, 1974; Krebs et al., 1972; Caraco, 1979a, b; Barnard, 1978; 1980a, b, c; Barnard & Sibly, 1981; Barnard & Stephens, 1981; Rohwer & Ewald, 1981).

At least in feeding flocks, recent work has attempted to quantify the relationship between changing costs and benefits within flocks and flock size distribution with species populations (Caraco, 1979a, b, 1980; Caraco et al., 1980, 1981; Barnard, 1980a, b, c; Barnard & Stephens, 1981). An important point emerging from this work is that individuals within a flock are not necessarily of equal utility to one another. Barnard (1978); Caraco (1979b); Barnard & Sibly (1981) and Rohwer & Ewald (1981), for instance, have shown that birds fare differently depending on the dominance status or feeding strategy of others in the flock. The composition of the flock in terms of status and feeding strategies appears to

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exert an important influence on flock size and stability (e.g. Caraco, 1979a, b, 1980; Barnard & Sibly, 1981). In this paper, we extend this approach to mixed species feeding flocks.

In the past, there has been a tendency to explain mixed flocks in terms of performing one particular function (e.g. Morse, 1970; Miller, 1922). Powell (1980), for instance, analysed data from neotropical mixed flocks to see whether flocking improved feeding efficiency or protection from predators in the same way as was earlier proposed for single species flocking (e.g. Murton, 1971; see Lazarus, 1972 for a critique). However, since even closely related species in mixed flocks are likely to have different feeding requirements and foraging strategies it seems reasonable to expect that the way individual behaviour changes as a result of joining a flock will depend on the species mixture (qualitative and quantitative) within the flock. A number of studies have shown that feeding in association with other species changes individual foraging strategies in ways that are different from changes brought about by single-species flocking. For instance, birds may search in new areas or in different ways (Krebs, 1973; Greig-Smith, 1978; Morse, 1978) or heterospecifics may make different types of food available (Rubenstein et al., 1977; Balph & Balph, 1979). Recent work on mixed flocks of lapwings (Vanellus vanellus) and golden plovers (Pluvialis apricaria) has shown that the effect one species has on another's feeding behaviour depends on the presence or absence of a third species (kleptoparasitic black-headed gulls (Larus ridibundus)) (Barnard & Stephens, 1981; Barnard et al., 1982). Changes in the effects of one species on others in the flock were reflected in changes in the number of individuals of each species in the flock (Barnard et al., 1982). In this paper we compare the effects of single and mixed species flocking on individual birds in winter populations of fieldfares and redwings. The aim of the study was to quantify changes in behaviour which were attributable independently to single species and mixed species flocking and to relate these changes to relevant environmental variables. Since the fieldfare and redwing flocks were feeding flocks, the effects of flock size and composition and environmental variables on individuals feeding efficiency was also examined.

The study area

The study area chosen was a region of agricultural pastureland near the villages of Wysall and Rempstone, about 15 kms southeast of Nottingham. Pastures varied in size from 1.34 ha to 6.85 ha, and in age from 1 to over 400 years. All pastures were bounded by hedgerows (mainly of hawthorn) of varying height and density. Observations were made during the winters (November-February) of 1979/1980 and 1980/1981. Fieldfares tended