Flock size and orientation accuracy of refuging Wagtail *(Motacilla alba)* flocks

Schwarmgröße und Orientierungsgenauigkeit von Bachstelzen (Motacilla alba) auf dem Schlafplatzflug

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Key Words: Motacilla alba, Flock size, orientation

Abstract

The headings of flocks of four or more refuging white wagtails *(Motacilla alba)* were significantly more accurate than those of single birds. Encounters between single refuging birds resulted in a short lived bout of aggression. It is suggested that foraging success might be affecting the status of a bird in a refuging flock by acting indirectly through condition, with birds evaluating one another's condition in a low intensity aggressive encounter.

Zusammenfassung

Die Richtungen von Gruppen von 4 oder mehr Bachstelzen *(Motacilla alba)*auf dem Schlafplatzflug waren genauer als die von Einzelvögeln. Begegnen sich Einzelvögel während des Schlafplatzfluges, kommt es zu einer kurzen aggressiven Auseinandersetzung in der Luft, worauf die Vögel den Flug zusammen fortsetzen. Es wird die Möglichkeit erörtert, daß der Nahrungssucherfolg indirekt den Status eines Vogels im Schwarm durch seine jeweilige Kondition beeinflußt. Die aggressiven Auseinandersetzungen könnten dazu dienen, die Kondition abzuschätzen.

Introduction

Various authors have suggested that the dispersion of headings adopted by a flock is an inverse function of flock size (BERGMAN& DONNER 1964, HAMILTON 1967, LARKIN & WALTON 1969, WALLRAFF 1978). The literature contains data which support the hypothesis (MATTHEWS 1962, HAMILTON 1967, RABØL& NOER 1973) as well as data which do not (KEE-TON 1970). In this paper, further evidence is presented which suggests that flocks orient more accurately than single birds.

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Methods

The White wagtail (*Motacilla alba*) is a winter resident in the Maltese islands, with wintering populations of more than 2500 birds (SULTANA, GAUCI & BEAMAN 1975). The entire wintering population is only known to have used two roosts in recent years. The roost in Great Siege Square, Valletta, which previously received the entire population, has declined in importance relative to that at Marsa Industrial estate (CURMI 1977, pres. obs.) and the headings of most wagtails passing over the observation point in Bkara suggest that the latter roost is their destination.

Observations were made between 1615 and 1700 Central European Time on most days between 12th November and 10th December 1979. Birds were located by sight and tracked visually until they disappeared from view at a distance of about 200 m. The disappearance bearings of birds which passed within 10 m on either side of the observer were noted to the nearest 5°. Only data obtained under clear skies when wind strength was below 5 knots are employed in the following analysis.

Results

Data for single birds and flocks of four or more birds are shown in Figures 1 and 2. The resultant vector for flocks of four or more is significantly greater than for single birds. On three occasions, single birds approached one another in flight close enough to interact. On each of these occasions, the birds chased one another, calling frequently. Within a few seconds the encounter had ceased to be overtly aggressive, and the birds flew together as a

single flock.



Fig. 1: Disappearance bearings of single White Wagtails returning to roost. R = .9163; $\Theta = 135.37^{\circ}$. Abb. 1: Abflugrichtungen einzelner Bachstelzen auf dem Schlafplatzflug.



Fig. 2: Disappearance bearings of flocks of four or more White Wagtails returning to roost. $R = .9786; \Theta = 147.70^{\circ}$. The resultant vector is significantly longer than that for single birds. P < .01. Tested using the method of MARDIA (1972, p. 162).

Abb. 2: Abflugrichtungen von Gruppen von vier oder mehr Bachstelzen auf dem Schlafplatzflug. Der resultierende Vektor ist signifikant größer als bei Einzelvögeln.

Discussion

The radial movements of refuging birds have not received much attention by students of bird orientation. This may be due in part to an assumption that the birds are homing towards a goal (roost or feeding area) and not flying a simple compass course. However, the latter alternative is by far the simpler method to adopt, and refuging birds may fly directly towards the roost only when visual contact is made. The lie of the land is such that birds flying over the observation point are not within sight of the roost.

WALLRAFF (1978) has pointed out that individuals composing a flock may not contribute equally towards the flock's mean direction. Experienced adult migrants are likely to lead inexperienced juveniles. Many refuging birds appear to utilize communal roosts as information centres for food finding (WARD & ZAHAVI 1973). Foraging success might thus form the basis of a hierarchy, acting indirectly through the condition of the birds. Birds in good condition are likely to be foraging successfully and might be expected to occupy a high rank in a system where foraging ability is important. It is interesting in this respect that aggressive interactions were observed during encounters between refuging individuals. Foraging success might be affecting the status of a bird in a refuging flock by acting indirectly through condition, with birds evaluating one another's condition in a low intensity encounter. By allowing birds to evaluate the condition of other birds dispersing in the same direction, such a system would allow the birds to decide as to the profitability of continuing to disperse in that direction.

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