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Edward Grey Institute,
Department of Zoology,
South Parks Road, Oxford OX1 3PS
Research Unit on the Rehabilitation of Oiled Seabirds,
Department of Zoology,
University of Newcastle-upon-Tyne NE1 7RU

T. R. BIRKHEAD

A. M. TAYLOR

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SEASONAL CHANGES IN THE FEEDING BEHAVIOUR OF FLOCKS OF SEEDEATERS AND GRASSQUITS

Mixed species assemblages of Costa Rican finches showed increased feeding efficiency due to inter-specific social learning at the beginning of the dry season (Rubenstein *et al.* 1977). The objective of our study was to determine if the feeding behaviour of these finches changed at the end of the dry season in March (CATIE 1974) when resources were most limited. During mid-March 1974 and 1975, near Turrialba, Costa Rica, we observed for approximately 40 hours some of the same finch species at three sites. Two of the sites consisted of a single Bottle Brush tree *Callistrimon citrirus* (Myrtaceae), each located in a different yard on the grounds of the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). One tree was twice the height and had about

TABLE 1

Average feeding bouts length times

Group	Average feeding time (min)	<i>n</i>
Field site males	4.82 ± 3.25	27
Field site females	3.54 ± 2.68	8 >ns
Field site Black Seedeaters	4.40 ± 2.71	20
Field site Yellow-faced Grassquits	4.71 ± 3.73	15 >ns
Field site birds with neighbours	5.11 ± 3.54	20 >*
Field site birds without neighbours	3.45 ± 2.35	15 >*
Field site birds with one neighbour	3.26 ± 2.02	13 >ns
Field site birds with two or more neighbours	9.22 ± 1.66	7 >*
Tree site 1	1.88 ± 2.15	37
Tree site 2	2.32 ± 1.56	16 >ns
Tree sites Yellow-faced Grassquits, males	1.56 ± 1.55	30 >*
Tree sites Yellow-faced Grassquits, females	2.60 ± 2.36	23
Tree sites birds with neighbours	2.21 ± 2.15	33
Tree sites birds without neighbours	1.69 ± 1.68	20 >ns

Notes: ns indicates no significant differences between groups whose sample sizes (*n*) are joined by solid lines on the right side of the table.

* indicates significant differences, $P < 0.05$, as determined by the Mann-Whitney Test.

twice as many flowering tassels as the other. The third site (Field site) was a small farm field (0.05 ha) which contained several chickens and a cow.

A total of 113 birds were observed at the three sites. Of these, 88 fed during the observation period. The non-parametric Mann-Whitney two-tailed test was used to detect statistical differences between groups for the parameters measured in the same manner as in January 1973 (Rubenstein *et al.* 1977).

Unlike the multiple species flocks seen at the beginning of the dry season, the feeding flocks at the end of the dry season usually consisted of either Yellow-faced Grassquits *Tiaris olivacea* or Black Seed eaters *Sporophila aurita*, with only a few individuals of the other species. White-collared Seed eaters *Sporophila torquella* and Rufous-collared Sparrows *Zonotrichia capensis* were seen occasionally in the flocks at the Field site. Of these four species, only Yellow-faced Grassquits were seen feeding in the two observed trees. Tennessee Warblers *Vermivora peregrina*, Yellow Warblers *Dendroica petechia*, Orchard Orioles *Icterus spurius*, Rufous-tailed Hummingbirds *Amazilia tsacatl*, Bananaquits *Coereba flaveola*, and White-lined Tanagers *Tachyphonus rufus* were also seen feeding in the two trees.

The data were analysed to determine if site, sex, or presence of neighbours influenced the duration of a feeding bout (Table 1). At the Field site, there was no significant difference in feeding bout length between Black Seed eaters and Yellow-faced Grassquits or between males and females. The presence of neighbours, regardless of species, significantly increased the feeding bout durations (without neighbours, mean 3.45 ± 2.35 min; with neighbours, mean 5.11 ± 3.54 min: $T_{15,20} = 100.5$, $P < 0.05$). The difference is the result of a nearly threefold increase in the average feeding bout time of those individuals who had two or more neighbours (with more than two neighbours, mean 9.22 ± 1.66 min). Those birds with only one neighbour did not differ in time spent per feeding bout from solitary individuals, birds whose nearest neighbour was more than three metres distant.

In the trees, however, males fed for significantly shorter durations than females (males, mean 1.61 ± 1.57 min; females, mean 2.60 ± 2.36 min: $T_{23,29} = 438$, $P < 0.05$). The males in the trees also fed for shorter durations than males at the Field site (tree males, mean 1.61 ± 1.57 min; field males, mean 4.94 ± 3.27 min: $T_{20,29} = 629$, $P < 0.01$). The presence of neighbours did not affect the duration of feeding bouts of Yellow-faced Grassquits in the trees.

TABLE 2

Diameters and dry weights of testes of Yellow-faced Grassquit, Black Seed eaters

Species	Collection date	Diameter (mm)		Dry weight (mg)	
		1	2	1	2
Yellow-faced Grassquit	15 March 1974	2.39	1.88	0.30	0.22
Black Seed eater	14 March 1974	3.61	2.89	1.65	1.00
Black Seed eater	15 March 1974	5.00	4.82	3.34	1.80

Two male seed eaters and one male grassquit were collected in 1974. The dry weights and diameters of their testes, measured prior to drying, are given in Table 2. All testes were enlarged, indicating the breeding season had begun. Skutch (1954) reported that the grassquit breeding season commences in April and continues into September.

Males in Bottle Brush trees frequently chased other males or females. In fact, 38% of all males observed in the trees ($n = 40$) were involved in chases. While 21% of the male Black Seed eaters at the Field site ($n = 24$) chased other birds, no male grassquit

did ($n = 12$). In the trees, 33% of the males sang at least one song as compared to 25% of the grassquit males at the Field site. Grassquit courtship behaviour in which the male faces the female and vigorously flutters his wings was occasionally observed in the trees but never at the Field site. This suggests that courtship occurs primarily in the trees where conspecific density is high, which may explain why feeding bouts are much shorter in the trees than on the ground.

Diverse mixed-species flocks were infrequently observed at the end of the dry season. A possible reason for the attenuation of the heterospecific flocks is that, with the approach of the breeding season, successful individuals must not only find food but also mates. Yellow-faced Grassquit and Black Seedeater females are very similar in plumage. Since it is important not only to choose a mate of the correct species but also to discriminate among all possible conspecifics, birds may minimize the time spent in aggregates with other species. In so doing, the advantages of social facilitation might be dampened but not necessarily obliterated. Once an individual has obtained a mate, the premium for participation in monospecific flocks may be considerably less.

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Department of Zoology,
 Duke University,
 Durham, North Carolina 27706
 U.S.A.

LINCOLN FAIRCHILD
 DANIEL I. RUBENSTEIN
 SEBASTIAN T. PATTI
 PETER H. KLOFFER

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