when acorns are in short supply. That this was probably not the case in Water Canyon is suggested by the fact that while piñon nuts were plentiful, the acorn crop also was good. The majority of the groups did not deplete their mast stores over the winter, and many acorns and piñon nuts remained in the storage trees through the summer.

Bock and Bock (Am. Nat. 108:694–698, 1974) recently proposed that the distribution and abundance of the Acorn Woodpecker are affected not only by the abundance of oaks within a habitat, but also by the oak species diversity present. Because there may be an occasional failure of the production of acorns in each oak species, fewer species in an area would increase the probability of a total acorn crop failure. The use of piñon nuts by the woodpeckers in Water Canyon would be significant since there are only 2 oak species present. If the storage and consumption of piñon nuts which we observed is common, it would suggest that the diet of the species in this area has been expanded to regularly include an additional resource. This in turn would increase both resource abundance and diversity, and if the Bocks' hypothesis is correct, would allow the population to both reach and maintain a higher size than would be possible with acorn storage alone.

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Flocking and foraging in the Scarlet-rumped Tanager.—Efficiency in foraging may be an important factor in the evolution of bird flocks (Cody, Theor. Pop. Biol. 2: 142–158, 1971). In order to test this suggestion, it is desirable to have field data showing an association between flocking and foraging behaviors. This note reports data for these behaviors taken on the Scarlet-rumped Tanager (*Ramphocelus passerinii*) in Costa Rica.

Investigations were carried out during August, 1973 at the Tropical Science Center research station near Rincon on the Osa Peninsula in southwestern Costa Rica. Areas of forest edge along roadsides and river banks were searched for Scarlet-rumped Tanagers. The bushes and dense vegetation of these areas are the favored habitat of this tanager, and the close proximity of the forest provided opportunities to occasionally observe Scarlet-rumped Tanagers flocking with species of the forest interior. All observations were made between 05:30 and 11:30. Data were taken only on adult males as their striking plumage made them easier to follow than females.

It is important to differentiate between flocks and aggregations. A flock was defined as a multi-individual group of birds moving in an integrated fashion, i.e. birds moving together as a unit from place to place. An aggregation was a multi-individual group with individuals in close proximity to one another, but which did not move in an integrated manner. For each flock, data on 4 variables were taken: (1) group size—the total number of individuals in the flock. Groups with at least 2 species present were designated mixed-species flocks, groups with only Scarlet-rumped Tanagers were designated single-species flocks; (2) foraging rate—the number of feeding attempts in 15 sec intervals were counted. A feeding attempt was defined as a peck at fruit or insects. Use of an electronic timer and tape recorder allowed continuous observations. It was not possible to obtain an indication of success in these attempts; (3) foraging height—the height of the bird from the ground was estimated in categories of 5 m; (4) group move-

TABLE 1

CORRELATION COEFFICIENTS FOR PAIRS OF ALL VARIABLES FOR ALL FLOCKS (A) AND SINGLE-SPECIES FLOCKS (S)

		Group Size	Foraging Rate	Foraging Height
Foraging	A	0.91*		
Rate	S	0.55*		
Foraging	A	0.78*	0.76*	
Height	S	-0.09	-0.05	
Group	A	0.86*	0.90*	0.77*
Movement	S	-0.03	-0.05	-0.01

* Indicates significance at the p = 0.05 level.

ment—the net rate of movement in one direction, i.e. "doubling-back" results in zero net movement. When possible, all data were taken on the first male seen in each flock. An effort was made to see as many flocks as possible.

During the course of the study, 34 flocks were encountered; 29 of these flocks were single-species flocks. Species seen in at least 2 of the 5 mixed-species flocks with Scarlet-rumped Tanagers included the Short-billed Pigeon (*Columba nigrirostris*), Red-capped Manakin (*Pipra mentalis*), Black-crowned Tityra (*Tityra inquisitor*), Masked Tityra (*T. semifasciata*), Green Honeycreeper (*Chlorophanes spiza*), Masked Tanager (*Tangara larvata*), White-shouldered Tanager (*Tachyphonus luctosus*), and Variable Seedeater (*Sporophila aurita*). Relationships between all possible pairs of the 4 variables were examined by correlation analysis. Two sets of correlations were calculated: one set for all data and one set for single-species flocks.

When all flocks are considered, there are significant positive correlations between all possible pairs of the 4 variables (Table 1). This suggests that Scarlet-rumped Tanager males alter their behavior as flocks become larger, showing increased foraging rate, increased group movement, and an increase in the height in the canopy at which the activities are performed. Foraging would seem therefore, to be a functional correlate of flocking. In single-species flocks foraging rate is still positively correlated with group

TABLE 2

A COMPARISON OF SCARLET-RUMPED TANAGERS IN MIXED AND SINGLE-SPECIES FLOCKS ON THE BASIS OF GROUP SIZE AND 3 BEHAVIORAL PARAMETERS*

Flock type	Observation time sec	Group size (S.D.)	Foraging rate pecks/min (S.D.)	Foraging height m (S.D.)	Group movement m/min (S.D.)
Mixed-species	855	21(7.8)	6(2.8)	21(7.4)	8(5.6)
Single-species	4770	4(2.3)	1(0.7)	7(3.9)	1(1.0)
All	5625	7(6.9)	1(2.2)	9(6.7)	2(3.5)

* Values are means with 1 standard deviation in parentheses, except for observation time which is total time.

size (Table 1), but no other pair of variables is significantly correlated. Social factors may be important in single-species flocks, and family members may stay together even when not foraging.

The preceding analysis indicates that it is the combination of the data on mixed-species flocks and those on single-species which produce most of the significant correlations for the data on all flocks. Mixed-species flocks may be functionally distinct from single-species flocks, a point also suggested by examining the mean values for all variables (Table 2). All means are greater for tanagers in mixed-species flocks than for those in single-species flocks (Mann-Whitney U-test, $p < 0.01$), indicating that tanagers move at a faster rate and forage faster and higher in the mixed-species flocks.

Scarlet-rumped Tanagers may gain any number of several advantages from joining large mixed-species flocks. Some possible advantages are: flocks may help the tanagers locate fruiting trees; flocks may "flush" insects; competition may be reduced by monitoring other species with similar food habits; there may be increased protection from predators in a flock which allows the tanagers to increase foraging. These and other ideas pertaining to flocking as an adaptation are discussed along with the pertinent literature elsewhere (Moriarty, Biologist 58: in press, 1976). Some or all of these benefits of flocking may also apply to single-species flocks, but if family relationships are an important aspect of single-species flocks, then it may not be surprising to find the foraging-related aspects of flocking occur more regularly and intensely in mixed-species flocks.

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Yellow Warbler nest used by a Least Flycatcher.—While checking Yellow Warbler (*Dendroica petechia*) nests near the Delta Marsh, Manitoba, I observed a Least Flycatcher (*Empidonax minimus*) making use of a deserted Yellow Warbler nest. The nest, 94 cm above the ground, was placed next to the trunk of a small maple (*Acer negundo*). On 5 June 1975 it contained 5 Yellow Warbler eggs but by 8 June only 1 egg was present and the nest's interior had been disturbed. An active Yellow Warbler nest was located several meters from the deserted nest; the first egg in this nest was laid about 12 June. On 14 June the first nest contained the single Yellow Warbler egg and 2 Least Flycatcher eggs. The nest was shallower now and there was no evidence that the flycatcher had added material to it. The flycatcher clutch was completed by the following day with the addition of a third egg; the Yellow Warbler egg was gone. One Least Flycatcher egg disappeared 6 days later but by 28 June, 2 nestlings were present. An empty nest on 29 June suggested predation had occurred.

Interest in old nests by the Least Flycatcher during the period of nest site selection has been noted by Mumford (unidentified nest, Wilson Bull. 74:98–99, 1962) and de Kiriline (Rose-breasted Grosbeak's nest: Audubon Mag. 50:149–153, 1948). No occupation occurred in either case. Use of nest material from a previous year's Yellow Warbler nest by a Least Flycatcher (pers. observ.) indicates that old nests may be a source of nest material.

It is possible that the Least Flycatcher was physiologically ready to lay, but since its own nest had been destroyed, it took over the available Yellow Warbler nest. I noted Least Flycatcher nest building in the area on 28 May. The present observations were therefore