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Notes on the Birds of Costa Rica with Special Emphasis on Flocking¹

BRIAN E. MLECKO²

Abstract. Bird flocks were observed at Barba, Costa Rica, from November, 1967, until June, 1968. A total of 364 flocks was analyzed as to: whether they were single or mixed species flocks, species composition, habitat preference, vertical stratum preference, seasonal occurrence, and disassociation. Possible factors involved are discussed.

Birds of the same species, and of different species, often form integrated groups or flocks. These flocks often contain many individuals and are very conspicuous. They seem to be formed most often during the period beginning about August or September and lasting until about March or April. This seems to be true both in the temperate and tropical latitudes.

Flocks are particularly well organized and common in the tropics. From July, 1967, until July, 1968, I was in Costa Rica, Central America, during which time I observed and took notes on many bird flocks. The following paper is a presentation of the data I gathered, together with some discussion and literature review.

The entire study was conducted at a single study site on the Pacific slope of Volcan Barba, in Heredia Province, Costa Rica. It was located at an altitude of 6,300 feet and included an area of about 25 hectares. About two-thirds of the site was in forest which occurred in long narrow strips separated by a semi-open area. The long strips of forest provided for an extensive edge habitat. The semi-open area, which was used as a pasture, included many scattered trees, tree stumps, and fallen logs.

The study site was divided into three habitat types: forest, edge, and semi-open; and three vertical strata, canopy, understory, and shrub, in order to record accurately the area occupied by each flock observed.

Flocks such as these are common among birds and have been studied by many naturalists in many different parts of the world. Authors who have written about such flocks include: Bates³ (1863), Wallace³ (1869), Belt³ (1874), Swynnerton³ (1915), Stresemann³ (1917), Chapin³ (1932), Winterbottom³ (1943 and 1949), Davis³ (1946), Stanford³ (1947), Johnson³ (1954), Slud (1960), Short (1961), Moynihan (1962), and McClure (1967).

³I did not examine the papers marked with a 3, but list them here as major sources in the literature on bird flocking in the tropics. The others were examined and are fully cited at the end of the paper.

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OBSERVATIONS

Flocks were encountered daily at Barba, and information as to what species were present in the flocks and the location of the flocks was recorded. The most common species in the flocks were: Bush Tanager (*Chlorospingus ophthalmicus*), Wilson's Warbler (*Wilsonia pusilla*), Black-throated Green Warbler (*Dendroica virens*), Slate-throated Redstart (*Myioborus miniatus*), Golden-winged Warbler (*Vermivora chrysotera*), Black and White Warbler (*Mniotilta varia*), Flame-throated Warbler (*Vermivora gutturalis*), Spot-crowned Woodcreeper (*Lepidocolaptes affinis*), and Yellow-thighed Finch (*Pselliophorus tibialis*), though other species oftentimes joined the flocks.

A total of 364 flocks was observed. Of these, 312 were mixed species flocks, that is, they were made up of two or more species, while 52 were one species flocks.

Table 1 shows the number of times each of the above listed species was recorded as a member of a mixed species flock, as a member of a one species flock, the total number of flocks in which the species was recorded, and the number of flocks recorded in which the species was not a member.

Table 1
Most Common Species Attending Flocks

Species	Total No. of Flocks	One Species Flocks	Mixed Species Flocks	Flocks in Which Species Was Not a Member
Wilson's Warbler	201	4	205	159
Black-throated Green Warbler	110	3	107	254
Golden-winged Warbler	80	0	80	284
Black and White Warbler	53	0	53	311
Bush Tanager	226	32	194	138
Slate-throated Redstart	98	6	92	266
Flame-throated Warbler	52	0	52	312
Spot-crowned Woodcreeper	50	0	50	314
Yellow-thighed Finch	41	7	34	323

No other species was observed to be a member of a flock more than 29 times, though I observed 63 different species on the study site. The flocks ranged from one species to nine species, with an average of 3.2 species per flock.

Flocks and Habitat Type

Flocks were seen in all habitat types at Barba. Sometimes the flocks were restricted to one habitat type while at other times they were scattered through two or even three habitat types. Table 2 shows the number of flocks which were recorded in each habitat type or in a combination of the habitat types.

Table 2
Flocks and Habitat Type

Forest	Edge	Semi-Open	Forest and Edge	Forest and Semi-Open	Edge and Semi-Open	Forest, Edge, and Semi-Open
121	99	63	40	0	38	3

Notice that whenever a flock was scattered through two habitat types, the two habitat types occupied were always adjacent to each other. This indicates that the members of the flocks tended to stick relatively close together.

The number of species in a flock varied with habitat type. The flocks, on the average, were larger in the forest than on the edge, and larger on the edge than in the semi-open. In the forest, 38.8 percent of the flocks contained four or more species; on the edge, 27.2 percent of the flocks contained four or more species; and in the semi-open, 17.4 percent of the flocks contained four or more species. Fifty-five percent of the flocks in a forest-edge situation contained four or more species, while 50 percent of the flocks in an edge-semi-open situation contained four or more species. These data indicate that flocks which were scattered through two habitat types were, on the average, larger than flocks which were restricted to one habitat type.

A possible explanation as to why flocks, on the average, tended to be larger in the forest than on the edge and larger on the edge than in the semi-open may be the density of the vegetation and the way in which the edge was defined.

To illustrate, if a large flock was traveling through the semi-open where the trees were several yards apart, the flock could easily, due to the trees being few and scattered, get separated into smaller flocks. On the edge and in the forest, where the vegetation was more dense, a large flock could more easily stay intact. However, since the edge was defined to include only the outer fringe of the forest and into the forest about 10 feet, when a flock on the edge began to get too large, it might have tended to overflow into the edge or semi-open and have been recorded as a flock covering two habitat types.

Flocks and Vertical Strata

Flocks were found in all vertical strata. The flocks were sometimes restricted to one vertical stratum while at other times they were scat-

tered through two or three vertical strata. Table 3 shows the number of flocks which were observed to occupy one vertical stratum or combinations of the vertical strata.

Table 3
Flocks and Vertical Strata

Canopy	Understory	Shrub	Ground	Canopy and Understory
50	97	10	2	98
Canopy and Shrub	Canopy and Ground	Canopy, Understory, and Shrub	Canopy, Understory, and Ground	Canopy, Shrub, and Ground
3	0	50	1	0
Canopy, Understory, Shrub, and Ground	Understory and Shrub	Understory and Ground	Understory, Shrub, and Ground	Shrub and Ground
0	46	2	4	1

Whenever flocks were scattered through two or more vertical strata, the strata occupied were almost always adjacent to one another. This indicates that flocks tended to stick relatively close together through vertical layers as well as through habitat types.

It seems that the more species in a flock, the more likely the flock was to occupy more than one vertical stratum. Twenty-eight percent of the one species flocks occupied more than one vertical stratum; likewise, 43.9 percent of the two species flocks, 54.6 percent of the three species flocks, 67.2 percent of the four species flocks, 81 percent of the six species flocks, and 100 percent of the seven, eight, and nine species flocks.

The flocks in the forest, on the average, occupied more than one vertical stratum more often than the flocks on the edge, and the flocks on the edge occupied more than one vertical stratum more often than the flocks in the semi-open. In the forest, 55.3 percent of the flocks occupied more than one vertical stratum, on the edge, 48.5 percent of the flocks occupied more than one vertical stratum, and in the semi-open, 47.6 percent of the flocks occupied more than one vertical stratum. These data correlate with the observation that the flocks in the forest tended to contain more species than the flocks on the edge, which tended to contain more species than the flocks in the semi-open. However, the differences here are not as significant.

When flocks were observed to occupy more than one vertical stratum, it was sometimes the result of one or more individuals moving freely from one vertical stratum to another, while at other times, it would be the result of a species with a distinct stratum preference joining the flock.

Moynihan (1962), in the mountains of Panama, made many of these same observations while studying flocks consisting of many of the same species as the flocks studied at Barba. Moynihan pointed out these data as a principal difference between high altitude mixed flocks (Barba would be high altitude) and low land mixed flocks. Low land mixed flocks, according to Moynihan, are "confined to a rather narrow level of vegetation." High altitude flocks on the other hand often occupy several levels of vegetation.

Moynihan hypothesized that these data may indicate that the species attending low land flocks are more restricted in their ecological niches than species attending high altitude flocks. He added, however, that this would be extremely difficult to prove.

Disassociation of the Flocks, Beginning of the Breeding Season, and the Departure of the Migrants

The number of flocks observed per hour of observation during each month was: November, 0.59; December, 2.31; January, 2.29; February, 2.18; March, 2.27, and April, 0.95. A few one species flocks and only one mixed species flock were seen after April.

The number of species joining flocks decreased in March and April from the number in the preceding months. Fifty-one percent of the flocks observed between November and February included four or more species, while only 19 percent of the flocks observed in March and April included four or more species.

This general "break up" of the flocks in March and April correlates with the start of the resident birds' breeding season and the start of the migrants' northward migration. Moynihan (1962), again in Panama, made the same observation, with regard to breeding season, and stated ". . . they (flocks) seem to be formed more frequently and include more birds of more species, on the average, during the non-breeding season than during the breeding season."

Since the number of species joining flocks began to decrease in March, but the number of flocks observed did not begin to decrease until April, it is possible that the pattern flocks follow before breaking up for the breeding season is, first, to contain fewer species and then to disassociate completely.

SUMMARY

During the period of November to April the birds at Barba formed flocks composed of individuals of different species and of the same species. These flocks were observed to be larger in the forest than on the edge, and larger on the edge than in the semi-open.

Flocks were often scattered through more than one vertical stratum.

The flocks at Barba disassociated for the breeding season. Since the number of species joining flocks began to decrease in March, but the

number of flocks observed did not begin to decrease until April, it seems that the pattern flocks follow before breaking up for the breeding season, is, first, to contain fewer species than to disassociate completely.

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