

OBSERVATIONS OF BIRDS EXPLOITING A CENTRAL AMERICAN FRUIT TREE

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SKUTCH (1954, 1960) provides some general information about the diets of various common Central American birds, but except for brief observational notes (Diamond and Terborgh, 1967, Land, 1963, Leck and Hilty, 1968, and Willis, 1966), comparatively little is known about the avian utilization of particular species of native trees. This study was undertaken to outline the exploitation of a single fruit tree in Costa Rica.

METHODS

This study was carried out in a disturbed river bottom forest along the Rio Higuero on the Finca Jimenez, near Cañas, Guanacaste Province, N.W. Costa Rica. This is a region of savanna and dry forest. An individual tree was studied from 11–15 July 1967, for a total of 16 hours between 06:00 and 11:00. Data gathered included the methods of feeding, daily arrival times, aggressive behavior (intra- and interspecific), and frequency of exploitation.

The tree selected was *Trichilia cuneata* (Family Meliaceae), a typical tropical fruit tree with conspicuous bird-attracting fruits. This species is found in thickets and forests from Guatemala to Panama (Standley, 1937:583). Its dehiscent fruits are about one centimeter in diameter, and each contains several soft green seeds. The pericarp is orange and cartilaginous, while the endocarp, which is exposed in the ripe fruit, is bright orange-red. The study tree (approximately 10 m tall with an ovoid crown) was suitable because its small size permitted me to record the total number of birds feeding in it.

RESULTS AND DISCUSSION

Frequency of visitations.—The number of individual visits for each species recorded in the 16 hours of observation is given below. Actual feeding on the fruit was observed for all species except those marked by an "O". The two most common species (marked with an asterisk) were present throughout most of the observation periods, and were not seen to make distinct trips to and from the tree. (The names are those used by Eisenmann, 1955).

Citreoline Trogon (<i>Trogon citreolus</i>)—15	O Piratic Flycatcher (<i>Legatus leucophaeus</i>)—1.
Golden-fronted Woodpecker (<i>Centurus aurifrons</i>)—*	Sulphur-bellied Flycatcher (<i>Myiodynastes luteiventris</i>)—5
O Streak-headed Woodcreeper (<i>Lepidocolaptes souleyetii</i>)—1	Streaked Flycatcher (<i>Myiodynastes maculatus</i>)—13
Masked Tityra (<i>Tityra semi-fasciata</i>)—21	Boat-billed Flycatcher (<i>Megarhynchus pitangua</i>)—7
Long-tailed Manakin (<i>Chiroxiphia linearis</i>)—35	Social Flycatcher (<i>Myiozetetes similis</i>)—3

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| O Greenish Elaenia (<i>Myiopagis viridicata</i>)—5 | O Clay-colored Robin (<i>Turdus grayi</i>)—3 |
| Magpie Jay (<i>Calocitta formosa</i>)—6 | Yellow-green Vireo (<i>Vireo flavoviridis</i>)—* |
| O Rufous-and-White Wren (<i>Thryothorus rufalbus</i>)—2 | Red-legged Honeycreeper (<i>Cyanerpes cyaneus</i>)—24 |

It is important in such studies to indicate (as was done by Land, 1963) the species actually seen feeding on fruits, for one cannot assume that all the visiting birds are eating the fruit. Some species may come to feed on the insects associated with the fruits (e.g. *Drosophila*), rather than the fruit itself. Other species may simply be attracted to the assemblages, and yet not actually be involved in feeding at the tree. Some observations I made on an *Apeiba tibourbou* (tree) which was *not* in fruit are relevant here. In five mornings of observation, I recorded 95 visits by 17 species of birds representing 10 families (S.W. Costa Rica, 7–11 August 1967). If the same species make similar visits to the tree while it is in fruit, assumptions concerning the use of the tree as a food resource could be erroneous. Thus, the interesting study by Diamond and Terborgh (1967), which lists species “assembled for the purpose of feeding” in two fruiting trees, would have been more valuable if they had indicated which species were actually seen feeding on the fruits.

It should be noted that a woodpecker, *Centurus aurifrons*, was one of the two most frequent visitors to the tree. Land (1963) found that another species of woodpecker, *Centurus pucherani*, was the most common visitor to a *Miconia* tree in Guatemala, and he was able to observe it eating fruits. In addition, Otvos (1967) has reported varying amounts of fruit eating in the several species of *Centurus* he studied in Costa Rica. The quantities of fruit in the diets of such woodpeckers, as well as many flycatchers, suggest that birds may have rather flexible feeding habits in the tropics (Diamond and Terborgh, 1967), and this should have interesting ecological implications, particularly with regard to niche sizes.

Among the nineteen other species which Land (1963) saw feeding on *Miconia* fruit, there are eight additional genera which I observed in this study: *Trogon*, *Tityra*, *Myiodynastes*, *Megarhynchus*, *Pitangus*, *Turdus*, *Tangara*, and *Thraupis*. The last three genera were also recorded by Willis (1966), while *Trogon* and *Tityra* were listed by Diamond and Terborgh (1967) in fruiting trees whose identity was not reported. It would be of interest to determine seasonal and geographical variations in the extent of fruit eating in such genera. For example, I have found that *Myiodynastes*, *Megarhynchus*, and *Myiozetetes* (all tyrannids) take significantly more berries in the dry season than during the latter part of the wet season, at

Barro Colorado Island, Canal Zone. This change is apparently correlated with the increased fruit abundance in the dry season.

Methods of feeding.—Two general types of feeding behavior were distinguished: (For species which use both methods, an asterisk indicates which method was used most frequently.) (1.) Species which capture fruit in a “flycatcher” fashion. The bird flies from a perch, takes the berry while in flight, and returns to the perch. Yellow-green Vireo, Citreoline Trogon, Boat-billed Flycatcher, Masked Tityra, Social Flycatcher, Sulphur-bellied Flycatcher, Streaked Flycatcher*, and Long-tailed Manakin*. (2.) Species which perched near the fruit and removed the berry from the pericarp while perched. Yellow-green Vireo*, Masked Tityra*, Golden-fronted Woodpecker, Red-legged Honeycreeper, Magpie Jay, Streaked Flycatcher, and Long-tailed Manakin.

The Boat-billed Flycatcher and the Magpie Jay both showed variations from these general methods of obtaining the berries. The flycatcher would occasionally take entire fruits and remove the pericarp by beating the fruit against the perch. Skutch (1960:353) recorded a similar behavior for this species when it feeds on cicadas. However this species most frequently obtained fruits in a typical flycatching fashion. The one Magpie Jay held a fruit against a branch with its foot, and pecked at the pericarp until the berry was removed. Parrots and toucans will also use their feet in fruit manipulation while feeding.

Numbers of birds.—Only seven of the sixteen species were ever observed to be represented by more than one individual at a given time. My observations agree with those of Diamond and Terborgh (1967) who state that “birds arrived at and left . . . fruiting trees as individuals or else as groups of several individuals belonging to one species.” The pattern of visitation of the seven species represented by more than one individual was as follows:

Citreoline Trogon—at the tree daily; two birds present together on two mornings, single individuals on the other mornings.

Golden-fronted Woodpecker—daily; usually several (1 male, 1 female, and an immature) visited the tree simultaneously.

Masked Tityra—daily; often two birds, although individual visits were also common.

Long-tailed Manakin—daily; generally a male and female together, sometimes a second male also present.

Magpie Jay—present only on 12 July, when a group of six invaded the tree for a short period.

Yellow-green Vireo—daily; usually several present, although single birds sometimes noted.

Red-legged Honeycreeper—daily; most frequently a male-female pair; on one morning a second male was also present.

TABLE 1
TOTAL NUMBERS OF SPECIES AND INDIVIDUALS VISITING THE TREE

	11 July	12 July	13 July	14 July	15 July
Number of species each morning	9	12	11	10	11
Number of individuals each morning	17	26	18	17	20

The total numbers of species and individuals utilizing the tree were quite similar on each of the five mornings of observation (Table 1). This might indicate that a given fruit tree is usually a food source for "local" birds only. Exceptions would include flocking species which tend to wander over large areas, such as the Magpie Jay, or solitary species which are highly mobile, such as the Mountain Elaenia (*Elaenia frantzii*) (Leck and Hilty, 1968). Thus, while the problem of competitive exclusion, as considered by Willis (1966), was not resolved, it seems that the fruit tree has specific limitations on the numbers of species and individuals using it imposed by spatial factors, in addition to factors inherent in the tree itself.

Aggressive behavior.—Table 2 summarizes the encounters observed. There were more cases of intraspecific (10) than interspecific (7) aggression. Since the encounters seldom caused the supplanted individual to leave the tree or to stop feeding, they apparently do not effectively reduce the competition which might exist, unless they significantly reduce the feeding rates. The intraspecific aggression may be based on individual territoriality, but further study is needed to clarify the basis of this behavior. Moynihan

TABLE 2
AGGRESSIVE ENCOUNTERS RECORDED AT THE TREE

Aggressor	Supplanted Species	No. of Records
Golden-fronted Woodpecker	Streaked Flycatcher	3
Golden-fronted Woodpecker	Yellow-green Vireo	1
Golden-fronted Woodpecker	Rufous-and-White Wren	1
Golden-fronted Woodpecker	Red-legged Honeycreeper	1
Golden-fronted Woodpecker	Sulphur-bellied Flycatcher	1
Golden-fronted Woodpecker	Golden-fronted Woodpecker	1
Yellow-green Vireo	Yellow-green Vireo	5
Streaked Flycatcher	Streaked Flycatcher	2
Citreoline Trogon	Citreoline Trogon	2

(1962) has provided some discussion on the role of supplanting attacks in the social behavior of coerebids and tanagers, from studies in Panama.

Daily arrival times.—Most species arrived shortly after sunrise. Ten species made their first arrival at the tree between 06:00 and 07:00, three species between 07:00 and 08:00, and three species after 08:00 (these late species were the Rufous-and-White Wren, Clay-colored Robin, and Streak-headed Woodcreeper). Activity was relatively constant each morning until about 09:00, when a rapid decline in the number of species at the tree was noted, and after 09:30 there was very little activity.

The pattern of early feeding may simply reflect a physiological need to eat as soon as activities are undertaken in the morning, and a general avoidance of activity during the warmer hours of the day. The fact that the various species feed more or less simultaneously may also indicate that there is a lack of competition for the fruits. My more recent studies in Panama have indicated that fruits are in fact often superabundant, with productivity far greater than utilization. If however the fruits are sometimes a limited resource, best available (i.e. in quantity and quality) in the early morning, then competition could also produce the observed early morning exploitation pattern. When such competition occurs, there is usually little or no "fruit fall" on the ground, and the fruits are eaten before they are ripe.

Additional notes.—In the same tree I studied, Dr. Arnold Small observed 12 species, including a Plain Xenops (*Xenops minutus*) and a Scrub Euphonia (*Tanagra affinis*). On another *Trichilia cuneata* in the same area, Dr. Small saw several Collared Araçari (*Pteroglossus torquatus*) eating, and I recorded feeding by a Kiskadee Flycatcher (*Pitangus sulphuratus*).

SUMMARY

A tropical fruit tree in the family Meliaceae was observed to be visited by 16 species of birds, representing 11 families. Of these, 11 species were actually observed feeding on the fruit; and two general methods of feeding were noted. A variety of intra- and interspecific aggressive interactions were recorded. Most species arrived before 07:00. The species exploiting the tree most frequently included a woodpecker, a manakin, and a vireo.

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ANNOUNCEMENT

A study is being conducted to determine the migration routes of Bald Eagles breeding in Minnesota and Bald Eagles wintering in South Dakota. Both immature and mature birds have been color-marked yellow, green, turquoise, or in combination. Information desired: color and portion of wing or tail that is marked, date of sighting, location, and activity of the bird. Exact time of sighting and name of person making the observation is also necessary. Send information to: Thomas C. Dunstan, Dept. of Biology, Univ. of South Dakota, Vermillion, South Dakota 57069.