

In more than 50 years of watching birds this is the first time that I have seen passerine birds in nocturnal pursuit of food. This experience, however, has been paralleled in Europe, according to J. D. Summers-Smith. (The House Sparrow, *New Naturalist Monogr.*, p. 37, 1963).—MAURICE BROUN, *Strawberry Hill Farm, New Ringgold, Pennsylvania 17960*. Accepted 4 Mar. 71.

**Food and migration habits of the Eastern Kingbird in Panama.**—The Eastern Kingbird (*Tyrannus tyrannus*), a species breeding in temperate North America chiefly east of the Rocky Mountains, is an abundant diurnal migrant through the Isthmus of Panama. It rarely winters in southern Middle America, most of the population moving to South America. I studied kingbird movements in the Panama Canal Zone in 1965–66 and again in 1970. The northward and southward migrations differed in several ways that seem to be correlated with food resources available to the birds in Middle America.

Kingbirds are conspicuous in the field for a longer time during the northward flight than in the southward migration and they appear to be generally more plentiful as migrants during the northward flight. All other common North American migrants show the opposite trend (Willis, 1966; Leck, 1970; pers. obs.). Slud (1960) found this also true for Costa Rica. In the Panama Canal Zone migrating Eastern Kingbirds have been seen from 5 March to 16 May (Eugene Eisenmann, pers. comm.). They are common from mid-March to the second week in May. In contrast, although Eisenmann has Panama records from 29 August to 26 November, most kingbirds transit the Panama Canal Zone during the 3- to 4-week period from mid-September to the second week in October. Russell (1964) notes a comparable difference for the two migration periods in British Honduras, as does Slud (1964) for Costa Rica.

The Eastern Kingbird is more conspicuous during the northward migration. When moving northward, kingbirds fly at or near treetop level in flocks of a few to more than 100 birds. During the southward flight kingbirds generally fly at high altitudes and in relatively smaller groups, although large concentrations are occasionally seen near the ground (Monroe, 1968). In late September I saw flocks of kingbirds flying in an easterly direction (i.e. towards South America) over the central part of the Panama Canal Zone. But, whereas they flew low here in April, now they were so high that I needed binoculars to identify them.

I suggest that these differences in the two migration periods may be due to changes in food availability. In the northward migration, the large kingbird flocks feed mainly on fruit, largely that of the tree *Didymopanax morototoni* (Araliaceae). Nine Eastern Kingbirds collected in late April 1970 had from 1 to 9 *Didymopanax* fruits in their stomachs. None of the stomachs contained insect fragments and I rarely saw kingbirds "hawk" after insects.

*Didymopanax* occurs throughout the New World tropics in second growth woods and mixed grassland with brush. The fruits, 4–6 mm long and slightly flat, are ripe during the local dry season from January to May in Panama and probably throughout Central America. The fruit occurs in large upright clusters that stick up through the top leaves of the tree. This growth habit probably makes the fruit more visible to migrating kingbirds. As migrating birds carry the seed farther than do resident birds, this strategy would have selective value for the tree through increasing seed dispersal.

Fruit is not common during the northern hemisphere fall in Panama, which corresponds with the height of the local rainy season. The trees then in fruit

are widely scattered and therefore do not form a predictable and plentiful food supply. Correspondingly my observations on southward-bound kingbirds show that they rely mainly on insects for food. Often kingbirds are found sitting on mowed lawns, frequently shifting position if prey is not found. On the ground, three or four birds sometimes compete for the same prey item, usually small leafhoppers. They also perch on small bushes and trees and "hawk" for insects. The necessity of relying on insect food during the southward flight means that the birds are competing for a limited resource and one that is less easily obtainable than fruit. During the northward migration the fruit constitutes a superabundant resource; the kingbirds are not competing for food and may even be relying on social clues to find some of it. Perhaps one of these clues is the conspicuous white terminal tail band of the Eastern Kingbird, a feature similar to that found in other gregarious fruit-eating species, such as the Cedar Waxwing, *Bombycilla cedrorum*.

Migratory North American flycatchers of the genera *Contopus*, *Nuttallornis*, and *Empidonax* seem to be strictly insect feeders even when fruit is abundant. It is significant that these species are territorial, or at least highly aggressive toward conspecifics, during migration and on their winter areas.

On the South American wintering grounds of the Eastern Kingbird, the fruiting season of *Didymopanax* is different than in Middle America. In September 1970 near Cali, Colombia, I found *Didymopanax* in fruit and some 500 to 600 kingbirds feeding in these trees. Snow (1962) reports manakins feeding on *Didymopanax* in Trinidad from October through March. Paul Schwartz (pers. comm.) indicates that *Didymopanax* may fruit throughout the year in Venezuela. If this is the fruiting season in wide areas of the kingbird's winter range, it suggests a reason for the kingbirds not wintering regularly in Middle America where little fruit is available until the dry season. Finding fruit abundant may be a clue to the birds that they have reached suitable winter habitat.

I wish to thank Eugene Eisenmann, Robert Dressler, Neal G. Smith, and W. John Smith for helpful criticisms of the manuscript. This study was supported by a Smithsonian Institution Visiting Research Associateship.

#### LITERATURE CITED

- LECK, C. F. 1970. The seasonal ecology of fruit and nectar eating birds in lower Middle America. Unpublished Ph.D. dissertation, Ithaca, New York, Cornell Univ.
- MONROE, B. L., JR. 1968. A distributional survey of the birds of Honduras. Ornithol. Monogr., No. 7.
- RUSSELL, S. M. 1964. A distributional study of the birds of British Honduras. Ornithol. Monogr., No. 1.
- SLUD, P. 1960. The birds of finca "La Selva," Costa Rica: a tropical wet forest locality. Bull. Amer. Mus. Nat. Hist., 121: 49-148.
- SLUD, P. 1964. The birds of Costa Rica. Bull. Amer. Mus. Nat. Hist., 182: 1-406.
- SNOW, D. W. 1962. A field study of the Black and White Manakin, *Manacus manacus*, in Trinidad. Zoologica, 47: 65-104.
- WILLIS, E. O. 1966. The role of migrant birds at swarms of army ants. Living Bird, 5: 187-231.

EUGENE S. MORTON, *Smithsonian Tropical Research Institute, Box 2072, Balboa, Canal Zone. Present address: Chesapeake Bay Center for Environmental Studies, Smithsonian Institution, Route 4, Box 622, Edgewater, Maryland 21037.* Accepted 5 Mar. 71.