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Dominance relationships in nectar-feeding birds at St. Croix.—In recent years there has been considerable research on the social hierarchy of nectar feeding birds at their food plants. I can add a report on the dominance relationships of one of the simplest nectar-feeding communities, that of a small hummingbird, a large hummingbird, and a coerebid in the Virgin Islands.

In eastern St. Croix, near the Fairleigh-Dickinson University West Indies Laboratory, the region is primarily Cactus-*Acacia* scrub and scattered dry forest, with an annual rainfall of less than 60 inches. Three nectar-feeding birds are common throughout the island; the Green-throated Carib (*Sericotes holosericeus*), the Antillean Crested Hummingbird (*Orthorhyncus cristatus*), and the Bananaquit (*Coereba flaveola newtoni*). All three were conspicuous at the flowers of succulents, especially at *Euphorbia* sp. (Euphorbiaceae) and *Bryophyllum* sp. (Crassulaceae). *Euphorbia* has small (2 cm) bright-red flowers, and was exploited by the Bananaquit and Antillean Crested Hummingbird. *Bryophyllum* has tubular (4 cm) flowers, light-green with purple, and was exploited by the Bananaquit (at the corolla base) and Green-throated Carib.

I watched the birds on 28 and 29 December 1971, and then recorded dominance relationships on 30 December, with notes on 242 supplanting attacks (08:00-10:00). I was able to watch the interactions closely in an area roughly 10 feet \times 50 feet, and noted the attacking and the supplanted species. The data yield a diagram of the social hierarchy based on dominance relationships (Figure 1).

Interspecific dominance is usually based on body size or weight superiority, and this is reflected here in the Bananaquit's dominance over the other two species

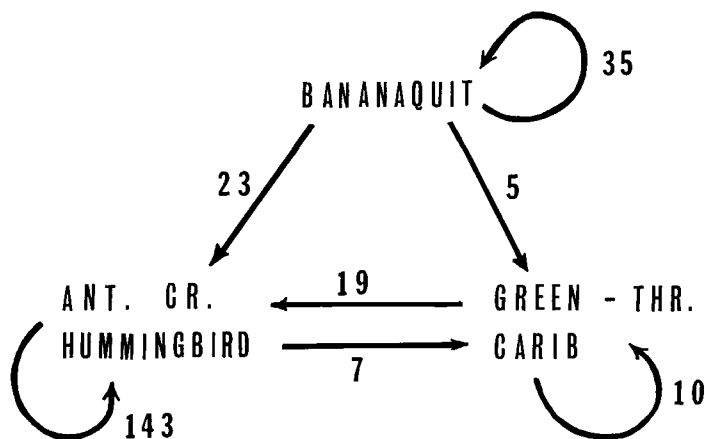


Figure 1. Dominance relationships of three nectar-feeders at St. Croix. Arrows point from supplanting species to supplanted species, with the number of records. Circular arrows represent intraspecific supplanting attacks.

TABLE 1
COMPARISON OF PHYSICAL PARAMETERS OF THE THREE SPECIES

Species	Length (in)	Weight (g)	Bill (mm)	Food plant corolla (cm)
Bananaquit	5	12	20	2-4
Green-throated Carib	4.5	4	25	4
Antillean Crested Hummingbird	3.5	3	14	2

(Table 1). The Bananaquit's attacks were most vigorous and immediate with *Orthorhyncus*, with which it shared preferred *Euphorbia* flowers.

Intraspecific attacks of the Bananaquit were characteristically noisy, but brief. *Sericotes* attacks of its own species usually involved long and rapid chases of the supplanted individual. *Orthorhyncus* intraspecific encounters were frequent and quite aggressive; pursuit flights were vigorous.

The simple hierarchy of these three nectar-feeders is obviously based on aggression, much as has been noted with hummingbirds in other areas, both temperate (Pitelka, Condor, 44: 189, 1942) and tropical (Stiles and Wolf, Auk, 87: 467, 1970). Interestingly, territories were not evident although they are often reported at flowering plants. Perhaps the population density of the three species is too high for efficient territoriality in the small area (8 *Sericotes*, 9 *Orthorhyncus*, and 10 *Coereba*). With such population densities territories might require far too much time in defense of intruders to be energetically worthwhile (Wolf and Hainsworth, Ecology, 52: 980, 1971). The interactions might change considerably in other seasons with different patterns of nectar availability.

The dominance relationships reported here and noted with nectar-feeders in general are in sharp contrast to the inter- and intraspecific attractions of fruit-feeders at their food plants (Leck, Wilson Bull., 83: 278, 1971). That nectar-feeders exhibit competitive aggression while the fruit-feeders usually share mutual benefits of flocking at superabundant resources seems to be a fundamental difference of the two feeding ecologies.

I worked under a grant from the Research Council of Rutgers University while in residence at the West Indies Laboratory of Fairleigh-Dickinson University.—CHARLES F. LECK, *Department of Zoology, Rutgers University, New Brunswick, New Jersey 08903*. Accepted 28 Apr. 72.

Absence of "individual distance" in the Tree Swallow during adverse weather.—Hediger (Wildtiere in Gefangenschaft, 1942; English edition, Wild animals in captivity, London, Butterworth, 1950) first proposed separating animals into "contact" and "distance" species. In his scheme, contact species tolerate physical contact in nonmating situations, but distance species respond with aggression or retreat to incursions within some critical "individual distance." Swallows are generally considered distance species. For instance Emlen (Condor, 54: 177, 1952) found that perching Cliff Swallows (*Petrochelidon pyrrhonota*) were intolerant of conspecific approach within about 4 inches (10 cm). Conder (Ibis, 91: 649, 1949) reports similar spacing in Barn Swallows (*Hirundo rustica*). Perching Tree Swallows (*Iridoprocne bicolor*) also normally maintain an individual distance (pers. observ.), but the spatial relations within a roosting flock I watched in April 1972 indicate that the "distance" concept is not universally applicable for this species.

Warm weather and southerly winds accompanied a large contingent of migrating