

estry and Wildlife for permission to work at French Frigate Shoals.

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Winter Range Expansion of the Long-billed Curlew (*Numenius americanus*) to South America

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On 7 February 1984, a Long-billed Curlew (*Numenius americanus*) was sighted and photographed on a mud flat of the Chacopata Lagoon (10°41'N, 63°46'W) on the north side of the Araya Peninsula, State of Sucre, in northeastern Venezuela. Another sighting, presumably of the same bird, was obtained at the same location on 20 February. One individual of this species also was seen in this area by Rosauro Navarro in October 1982, and on several occasions between August 1983 and January 1984 Gedio Marin and the second author saw up to 5 individuals at a time.

The A.O.U. check-list (1983: 186) reports *N. americanus* as wintering from central California and the southern U.S. south to southern Mexico, and irregularly to Guatemala, Honduras, Costa Rica, and Panama (accidental). The species is not listed as occurring in Venezuela nor elsewhere in South America (Meyer de Schauensee 1970, Meyer de Schauensee and Phelps 1978). The Long-billed Curlew was reported for Tobago under the name of *N. longirostris* by James Kirk in 1883 (French 1973), but French be-

lieves this record likely refers to the Whimbrel (*N. phaeopus*).

As far as we know, the present photographic evidence represents the first confirmed record of the Long-billed Curlew for continental South America. One copy of the color photograph has been deposited in the Colección Ornitológica Phelps in Caracas, and one is in the Ornithological Collection, Department of Biological Sciences, University of Montreal.

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Survivorship in Hummingbirds: Is Predation Important?

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The traditional optimal foraging models reviewed by Pyke et al. (1977) and Krebs (1978) focused on proximal factors that influence energetic costs and benefits in terms of their contributions to net rate of energy gain. In general, these models have assumed that the fitness value of foraging tactics is determined primarily by proximal factors such as quality and distribution of food patches, although a variety of other factors such as cryptic prey, territory defense, or predation risk also may significantly affect feeding rates (Caraco 1980). For example, sticklebacks (*Gasterosteus aculeatus*) alter their foraging tactics and feeding rates when predators are present (Milinski and Heller 1978), and feeding Blue Tits (*Parus caeruleus*) increase their scanning rates as predation risk increases (Leuchem 1983).

In a more general context, McCleery (1978) reviewed attempts to study how time budgets and behavior sequences are influenced by costs and benefits under conditions of conflicting demands. He concluded that to be accurate and predictive, optimization models and their associated decision rules must account for elements in the environment that constrain performance and significantly affect the expression of particular choices.

An advantage in the study of the behavioral ecology of nectar-feeding birds, and hummingbirds in particular, is the relative simplicity of the foraging system and the extent to which it lends itself to reasonably direct and uncomplicated field and labora-

tory measurements and experiments (Hainsworth 1981). It is an energy-limited system (Carpenter 1978, Gass and Montgomerie 1981) in which the amount and energy content of the food is easily measured in the field, the food sources are stationary and conspicuous, and the foraging behavior of these diurnal birds is easily observed (Gass and Montgomerie 1981). In this paper we review the literature of predation on hummingbirds for evidence of consistent amounts or patterns that would indicate that predation is a significant mortality factor.

Observed predation.—Table 1 shows the North American records of predation on "adult" hummingbirds (of unknown age from fledging) that are available from the literature. This does not include 4 records of hummingbirds caught in spider webs (Danforth 1921, Woods 1934, Stott 1951, Hoyt 1960) and one attacked by wasps (Grant 1959). The 13 recorded instances of predation involve 4 identified species of hummingbirds and a variety of predators (9), including insects, amphibia, and birds. Most of the instances listed in Table 1 occurred in flower gardens (7) or at hummingbird feeders (2). In the cases of predation by frogs and birds, the hummingbirds were eaten, but not by the mantids.

It is especially noteworthy that there are only 3 recorded instances of predation by raptors, and these cases were distributed among 3 raptor species. When Lowery (1938) found the remains of a Ruby-throated Hummingbird (*Archilochus colubris*) in the stomach of