significant increases in the multiple *R* value after step 1 for the Golden-crowned Kinglet or after step 2 for the Ruby-crowned Kinglet. For the Golden-crowned Kinglet winter precipitation alone resulted in an *R* of .80 (see Table 1), while for the Ruby-crowned Kinglet number of frost-free days and mean January temperature gave a multiple *R* of .70.

The results of this study indicate that in spite of extensive sympatry, there is a major difference in selection of winter climate regime by the 2 kinglet species. Golden-crowned Kinglets evidently prefer areas with significant levels of winter precipitation (Table 1); from Fig. 1 it can be seen that these areas are the moist forests of the Pacific Northwest and the mixed hardwood-pine communities of the coastal plain in the southeast. By contrast, the Ruby-crowned Kinglet winters most abundantly in areas with warm winter temperatures (Table 1), regardless of the amount of precipitation; the habitats involved appear more variable than those where the Golden-crowned Kinglet is common. Ruby-crowned Kinglets occupy forest understory, open or "edge" situations, desert scrub, xeric oak woodland, and chaparral (e.g., Jewett et al., Birds of Washington State, Univ. Wash. Press, Seattle, 1953; Burleigh, Georgia birds, Univ. Okla. Press, Norman, 1958; Miller and Stebbins, The lives of desert animals in Joshua Tree National Monument, Univ. Calif. Press, Berkeley, 1964).

These species provide an interesting example of the ways in which migratory birds may respond to suitable habitats. During the breeding season the Golden-crowned Kinglet usually is associated with dense and substantial conifer forests—especially of spruce (*Picea*)—and it breeds north only to the limits of the closed boreal forest (Bent, U.S. Natl. Mus. Bull. 196:382–418, 1949). In winter it migrates to warmer, moist, conifer forests, or less frequently (Fig. 1) to hardwood forests. The structural configurations of breeding and preferred winter habitats therefore are generally similar. The Ruby-crowned Kinglet also breeds across boreal Canada in conifers, but unlike the Golden-crowned Kinglet it occurs north to the very edge of the taiga (Bent, op. cit.), revealing a tolerance of, or perhaps even a preference for, open or edge habitats. This tolerance or preference also manifests itself in winter, when Ruby-crowned Kinglets are common in such habitats as desert scrub and chaparral.

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Vocal mimicry in the Thick-billed Euphonia.—Snow (Wilson Bull. 86:179, 1974) recently discussed vocal mimicry in the Violaceous Euphonia (*Euphonia violacea*) on Trinidad. In this species only males are known to mimic and they have their own song in addition to imitations. The imitations are probably learned from models living nearby, and nearly all the calls imitated are unmusical and staccato. Many of them are alarm or contact calls (Snow, op. cit.).

Here I report on mimicking in the Thick-billed Euphonia (*Euphonia laniirostris*), a species largely allopatric to the Violaceous, which occurs from southern Costa Rica to northern Bolivia and the western Amazon basin in Brazil (De Schauensee, Birds of South America, Livingston Publ. Co., Narbeth, Pa., 1966:465). My observations are from the Panama Canal Zone and were made in 1970, 1971, and January and March, 1974.

Both sexes of the Thick-bill use an imitation as a call note when they are inactive, usually solitary, and sitting high up in a tree crown. One female was collected to make

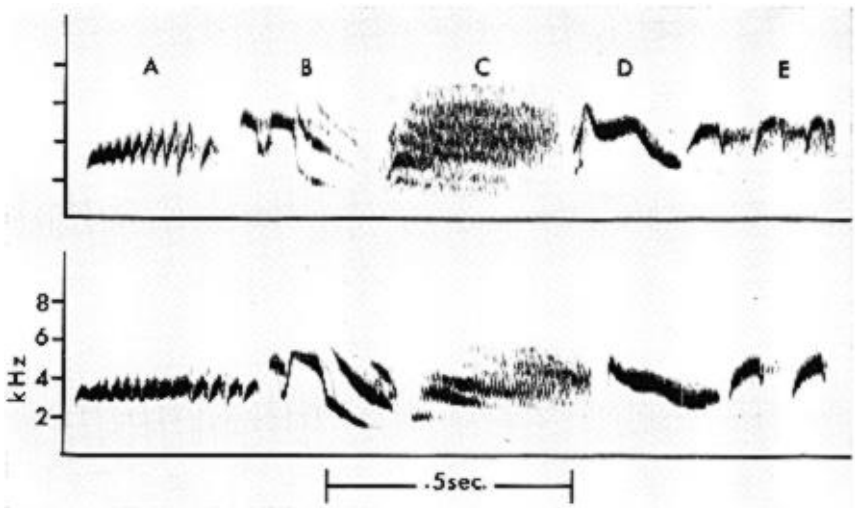

FIG. 1. Spectrograms (wide band filter setting) of calls mimicked by Thick-billed Euphonia (top) with the euphonia's imitation (bottom). A. Tropical Wood Pewee, *Contopus cinereus*; B. Social Flycatcher, *Myiozetetes similis*; C. Yellow-green Vireo, *Vireo flavoviridis*; D. Variable Seedeater, *Sporophila aurita*; E. Tropical Kingbird, *Tyrannus melanocholicus*. The spectrograms were positioned artificially, thus the time scale (horizontal axis) is indicated as a 0.5 sec interval, not continuous time.

certain that an immature male was not involved. The initial discovery that the Thick-bill imitates came in 1970 when, at Summit Gardens, Madden Lake Boy Scout Camp, and near Gamboa, I consistently heard them rendering the *peeayik* call characteristic of the common Paltry Tyrannulet (*Tyranniscus vilissimus*). In 1971, I called this note to the attention of E. Eisenmann, who thought *Tyranniscus* was calling until he saw the euphonia. In 1974 this same population was using the *peear* call note of the Variable Seedeater (*Sporophila aurita*) in the same context—none were heard imitating the Tyrannulet!

A second form of mimicking was discovered at Summit Gardens, Canal Zone, where I found 7 nests of the Thick-bill. The females, when frightened from the nest during incubation, or either sex when I was near a nest with young, would immediately begin imitating the calls of common birds nesting nearby. In every case where I knew the species being mimicked, it was the sound that the species would give if it were being frightened near its own nest (Fig. 1). The euphonia used the alarm calls of other species in their correct context and only imitated species nesting concurrently. In 2 instances euphonias evoked mobbing of me by Yellow-green Vireos (*Vireo flavoviridis*) by imitating the vireo's *nyaaah* alarm note. The euphonia remained still and continued mimicking when the vireos approached me.

The use of vocal mimicry to provoke mobbing may be the reason why many of the sounds imitated by the Thick-bill and the Violaceous Euphonias are "alarm" notes even when the birds use them in a social context. It is possible that mimicking to provoke mobbing was the origin of the mimicking habit but that it has since been incorporated into the euphonias' intraspecific social behavior as well.

Interestingly, although Snow (op. cit.) lists 2 thrush (*Turdus*) species as imitated by the Violaceous Euphonia, I never heard the Thick-bills mimic a thrush even though the Clay-colored Robin (*T. grayi*) was an abundant breeding species at Summit Gardens (Morton, Science 171:920, 1971). This robin's normal nest "defense," however, is to leave, so the euphonias may be selective in their choice of species to imitate, mimicking those that mob.

It should be clear that this report leaves more questions than it answers and I hope that this note stimulates studies of the ontogeny of mimicry in this genus.

I am grateful to Eugene Eisenmann for his stimulating discussions of tropical birds, to W. John Smith for making some of the recordings, and to the Smithsonian Tropical Research Institute and the National Geographic Society for providing funds for the study.
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Observations of vocal mimicry in the Thick-billed Euphonia.—Snow (Wilson Bull. 86:179–180, 1974) noted 17 species imitated by the Violaceous Euphonia, *Euphonia violacea,* in Trinidad. During 8 months on Isla de Santa Sofia II, an island in the Amazon River about 32 km northwest of Leticia, Amazonas, Colombia, I noted the Thick-billed Euphonia, *Euphonia laniirostris,* incorporating the call notes of many species into its song on numerous occasions. Table 1 presents a list of 25 species imitated on 9 separate singing bouts for which I have detailed notes. All observations were from either the island in wet second-growth forest or from the adjacent mainland in swampy or flooded (varzea) forest, usually in edge situations. All model species occurred in the same vicinity as the euphonia as noted by Snow, 1974 for *E. violacea* in Trinidad. Robinson (Emu 74:9–10, 1974) found that lyrebirds (*Menura*) do most of their imitating at a time of year when the models are not breeding and presumably the imitated sounds have reduced significance for the models; unfortunately, I have no data on either the breeding seasons of the models or the euphonia. All euphonias I observed imitating were solitary, adult males.

This species imitates a remarkable variety of sound types from harsh screams to soft call notes. The imitations themselves are excellent and would be indistinguishable to my ear from the models if heard by themselves. This was also noted for *E. violacea* by Snow. In contrast to *E. violacea,* however, *E. laniirostris* gave songs which were either "pure" *E. laniirostris* notes or pure imitations. The imitation sequences consisted of 15–20 notes in quick succession, involving about 10 different species; thus models' calls may be repeated within a sequence but seldom in succession. Individuals used both pure sequences and imitation sequences in the same singing bout, these often following each other after only a pause of a second or so.

Four other species of euphonia (*E. minuta, E. xanthogaster, E. chlorotica,* and *E. rufiventris*) were seen regularly in the same habitat as (and, except *E. rufiventris,* often in the same flocks with) *E. laniirostris,* but none was ever heard to mimic other species. As Snow (op. cit.) reports, there are no published accounts of vocal mimicry in other species of euphonias. This, in addition to plumage and morphologic similarities and basically allopatric ranges, strengthens the position that *E. laniirostris* and *E. violacea* are very closely related.