

THE PUZZLING VOCAL REPERTOIRE OF THE SOUTH AMERICAN
COLLARED JAY, *CYANOLYCA VIRIDICYANA MERIDA*

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Previously, I have indicated (Kansas Sci. Bull., 42:113, 1961) that the New World jays could be systematically grouped in two tribes on the basis of a variety of morphological and behavioral characteristics. I subsequently demonstrated (Occas. Papers Adams Ctr. Ecol. Studies, No. 11, 1964) the relationships between *Cyanolyca* and *Aphelocoma*. The tribe Aphelocomini, comprising the currently recognized genera *Aphelocoma* and *Cyanolyca*, may be characterized as follows: pattern and ornamentation of head simple, consisting of a dark mask, pale superciliary lineation, and no tendency for a crest; tail plain-tipped; vocal repertoire of one to three basic components, including alarm calls, flock-social calls, or both, that are nasal, querulous, and upwardly or doubly inflected. In contrast, the Cyanocoracini may be characterized as follows: pattern of head complex, consisting of triangular cheek patch, superciliary spot, and tendency for a crest; tail usually pale-tipped; vocal repertoire usually complex, commonly including a downwardly inflected *cawing* call and never an upwardly inflected, nasal querulous call (when repertoire is limited it almost always includes the *cawing* call). None of the four Mexican aphelocomine jays has more than three basic calls in its vocal repertoire.

There are two exclusively South American species of *Cyanolyca* (*C. viridicyana* and *C. pulchra*). On the basis of the consistency with which the Mexican and Central American species of this genus hew to a general pattern of vocalizations as I described it for the tribe, I inferred (1964 *op. cit.*, p. 1) that these two South American forms, then both unknown to me in the wild, would also exhibit the aphelocomine vocal characteristics.

When, in 1964, I received copies of the first field tape recordings of the species *C. viridicyana* of the race *merida*, made in southwestern Venezuela by Paul Schwartz, they proved puzzling to say the least. Indeed, my first reaction was to write Mr. Schwartz and ask for a clarification of the recording, requesting that he inform me which calls were those of jays and which were of other kinds of birds. To my surprise, he replied that most of the calls on the recording were those of the jays! Although I had noted that some of the calls thereon corresponded closely to aphelocomine "standards," some resembled those of cyanocoracine species, and others were unlike those of any other New World jays.

In July 1965 I was able personally to corroborate the existence of this unusual repertoire in *C. v. merida*. In the following discussion and analysis, I shall consider this repertoire acoustically, phylogenetically, systematically, and ecologically.

ANALYSIS OF VOCAL REPERTOIRE

The sonagrams. All spectrographic analysis shown in figures in this paper was produced on a Kay Electric Co. Sona-graph 662-A Model Recorder. Tapes made at 15 inches/sec in the field were transferred to 7.5 inches/sec recordings. Sonagrams were then made from the latter tapes, using the narrow band selector and the F-1 position on the shaping switch, which gives an essentially flat response within the 85-6000 cycles/sec range required. Sonagrams were then photographed on high-contrast copy film to create white backgrounds for the sound patterns.

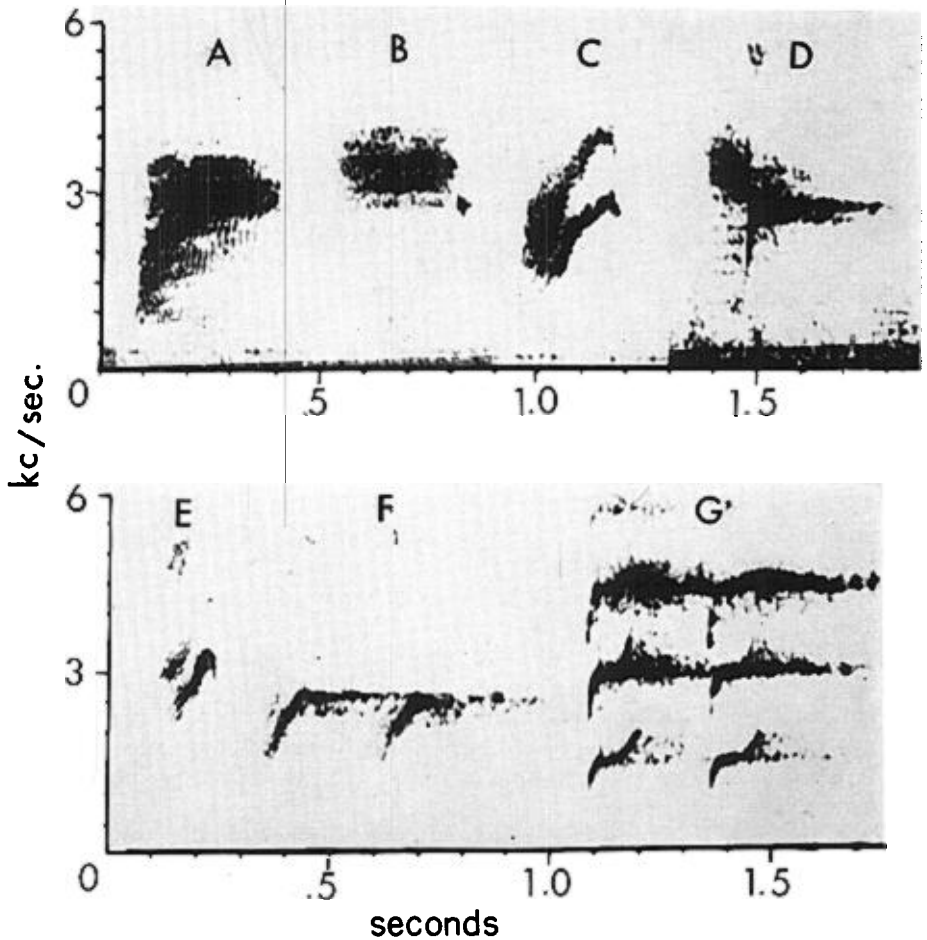


Figure 1. A., B. Two variations of the *schree* call of *Cyanolyca viridicyana merida*. C. *Reek!* call of *Aphelocoma coerulescens*. D. *Reek!* call of *C. v. merida*. E. *Reek!* call of *Aphelocoma ultramarina*. F. *Reek!* call of *A. unicolor*. G. *Reek!*-like call of *Cyanolyca cucullata*.

Figures 1, 2, and 3 illustrate the calls of *C. v. merida* which most resemble calls of the other New World Garrulinae or which an experienced listener might attribute to a jay. In addition, calls of other New World garrulines, which either in spectrographic structure or to the ear resemble calls of *C. v. merida*, are included. No one has studied the behavior of this species to an extent that allows naming of calls by reference to their apparent function. Therefore, calls discussed below are referred to by descriptive terms or phrases. When in other species there exist seemingly homologous calls, the behavioral functions or context of which are known, reference in parentheses to the suggested context follows the phonetic designation.

Schree and Reek! (*Alarm and Flock-social calls*). These upwardly inflected, nasal, querulous calls are the most characteristic vocalizations of the Alchelomini. Figures 1A and 1B are two variants of the soft *schree* call in the Collared Jay. Figure 1C is an homologous call of *Aphelocoma coerulescens*, which is aurally similar to 1A.

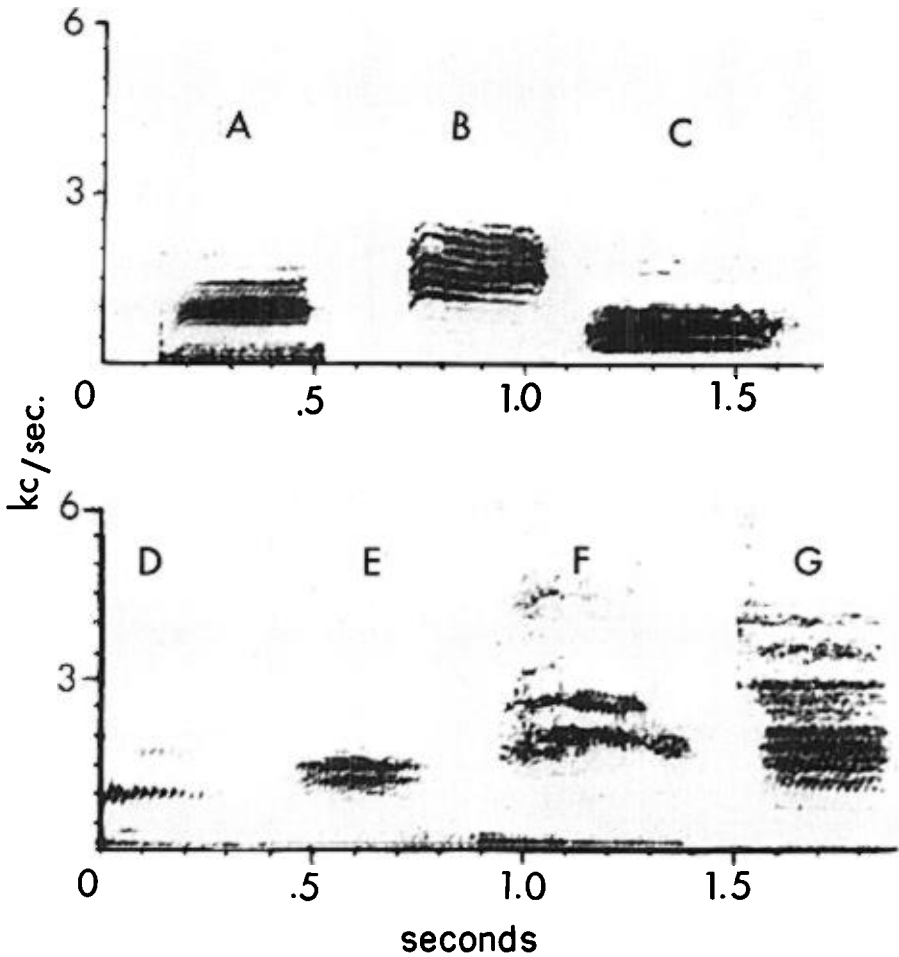


Figure 2. A. Soft *crooh* of *Cyanolyca viridicyana merida*. B. Alarm call of *Cissilopha yucatanica*. C. Same as B but at half-speed. D-G. Harsh *crashing* calls of *C. v. merida*.

Note especially in 1A and 1C the typical upward inflection and noisy structure (fuzzy, cluttered pattern, lack of clear tones, and harmonic structure). In contrast to the presence of the two clearly dominant components of 1C, note that there are intermediate tonal additives in 1A and 1B, which are evident to the ear. Because of these additives, the calls of *C. v. merida* should be less musical to the ear than that of *A. coerulescens*. However, because these calls are not forcefully given (this fact is not evident in the sonagrams) and because frequencies above and below the dominant components are present, fading out of representation upward and downward from them, the calls of the Collared Jay are actually less guttural or less sharply rendered. Although not shown, certain versions of the call of the Scrub Jay are similarly soft. All workers for whom I have played the *schree* calls of the Collared Jay have identified them as calls of the Scrub Jay. The *Reek!* of the Collared Jay (fig. 1D) is sharp, staccato, and aurally much like the *Reek!* calls of *Aphelocoma ultramarina* and *A.*

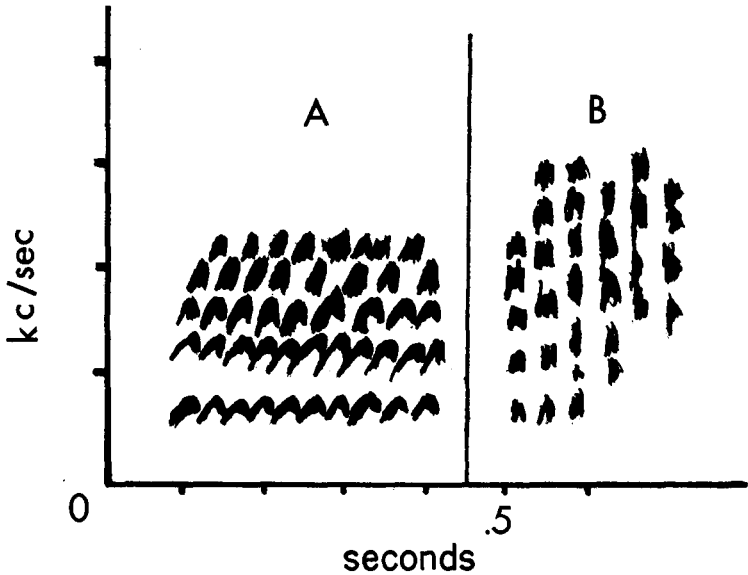


Figure 3. A. Schematic of figure 2D, showing displacement of syllables of vertically successive tones. B. Schematic of low-intensity "growling" warning sound of a parrot, *Aratinga canicularis*, showing vertical alignment of syllabic components of tones.

unicolor (figs. 1E and 1F). Its inflection is steeply upward. The homologous call of the congeneric Azure-hooded Jay, *Cyanolyca cucullata* (fig. 1G), is similarly inflected but slightly more prolonged and obviously very different in tonal quality, being a clear, rich whistled call, here shown as given twice in rapid succession.

Soft Craahs and Snoring calls. These downwardly inflected or uninflected calls resemble alarm calls of cyanocoracine jays, and so far as I have determined they are unique in species of the Aphelocomini. Figure 2A is a soft *croooh*, similar spectrographically to the louder and harsher alarm call of *Cissilopha yucutanica* (fig. 2B). An increase in resemblance is achieved when the call shown in figure 2B is reproduced at half-speed for analysis as in figure 2C. Figures 2D-G show slightly harsher *craahing* sounds that resemble the alarm notes of Steller's Jay, *Cyanocitta stelleri*, of western North America. Note that the vertical segmentation is less closely spaced as compared with the soft *craahs* of figure 2A. Although not clearly shown in these photographically reproduced sonagrams, the vertical segmentation of each successive prominent tone is displaced sideways so that the schematic structure is like that shown in figure 3A in contrast to 3B. Experienced listeners for whom I have played the harsh *snoring* or *craahing* calls of the Collared Jay have agreed on the remarkable similarity some of these have to the alarm cries of Steller's Jay.

Rapid chatter (Alarm and Flock-social call). The cyanocoracine jays, excepting the Blue Jay, *Cyanocitta cristata*, the Brown Jay, *Psilorhinus morio*, and perhaps the South American *Cyanocorax cyanomelas*, *caeruleus*, and *heilprini*, as yet vocally unfamiliar to me, typically have a rapid staccato chatter call which somewhat resembles the calls of certain woodpeckers (such as *Colaptes* spp., or *Dendrocopos* spp.). Note the resemblance between the rapid chatter of the Collared Jay (fig. 4A) and of the Peruvian *Cyanocorax mystacalis* (fig. 4B). In the latter species, such chatter is the

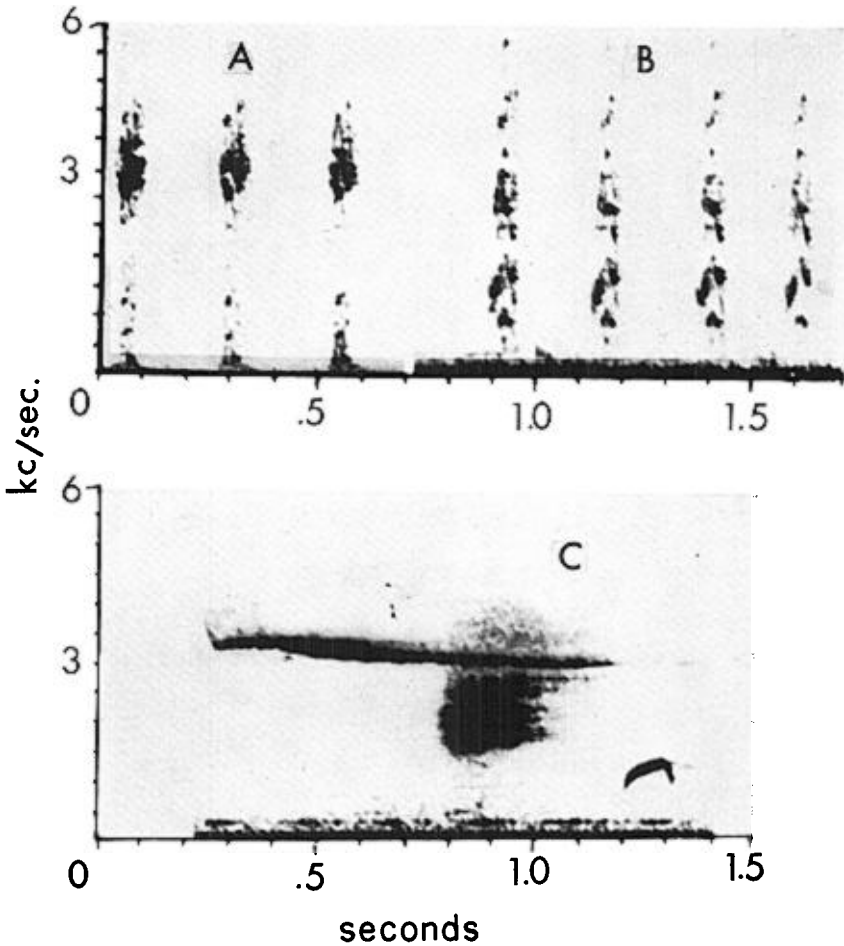


Figure 4. A. Rapid chatter of *Cyanolyca viridicyana merida*. B. Rapid chatter of *Cyanocorax mystacalis*. C. Craah-who-op call of *C. v. merida*.

principal vocal interplay between individuals in loose flocks. In the Collared Jay, the call is slightly higher pitched and seems more staccato and harsher to the ear. It is seldom given more than two or three times in succession, whereas sequences of from four to a dozen or more are characteristic of the cyanocoracines.

Craah-who-op call. This call (fig. 4C) possesses a component like the harsh *craahs* in figure 2D, plus a mellow two-syllable whistle that sounds higher pitched than the *craah*. This is due to its purer tonal quality, rather than to its seemingly higher pitch. The long, sustained tone that extends at about 3300 cycles/sec through the *craah who-op* is not a jay vocalization. There are some combinations of components in *Calocitta formosa*, the Magpie-jay, that somewhat resemble the *craah who-op*, although none similar enough to justify comparative illustration here. The *craah who-op* is definitely cyanocoracine in character.

Non-jaylike vocalizations. Sounds depicted in figure 5 are to my knowledge completely unlike those of any other New World jays. Figure 5A shows two high-pitched

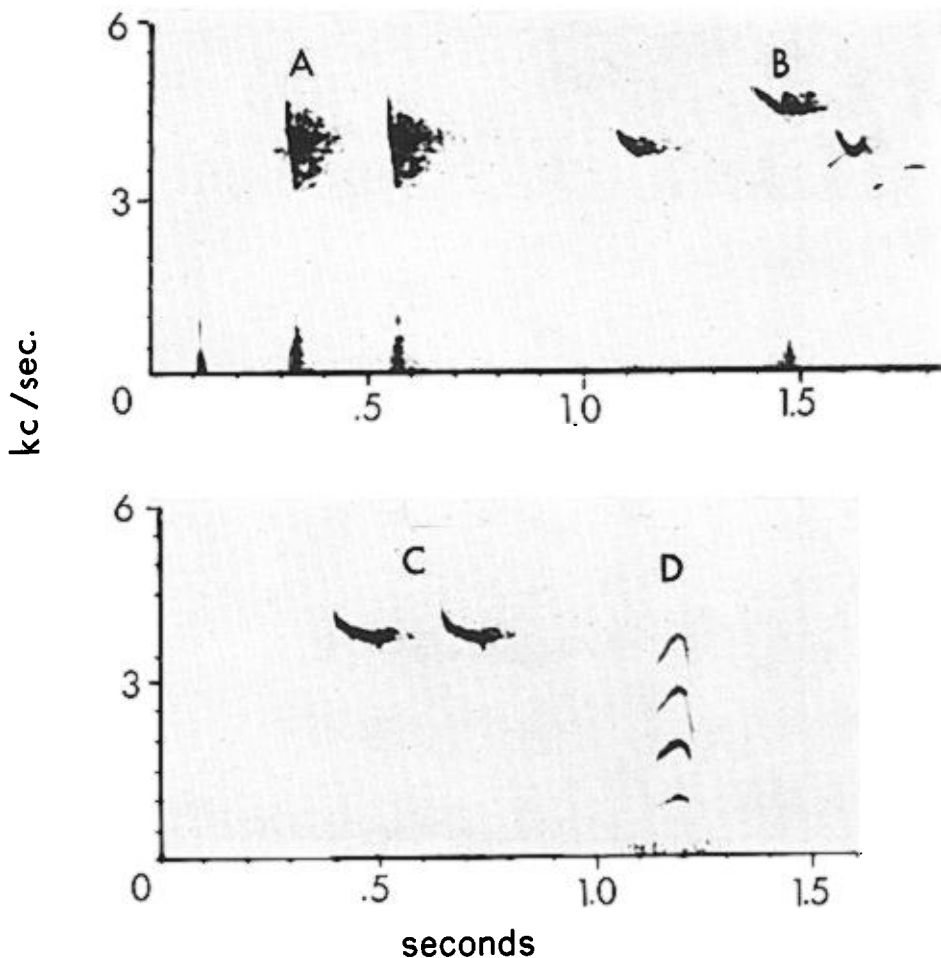


Figure 5. Non-jaylike vocalizations of *Cyanolyca viridicyana merida*. A. High-pitched *peep!* or *cheep!*. *Chee^{chee} weel!*. C. Other *peep* notes. D. Nuthatch-like note.

peep! or *cheep!* notes that are strikingly similar to notes of hatchling chicks of domestic fowl (*Gallus*). In the sonagram shown, they were followed by the three even higher notes that may be written *chee^{chee} weel!*, and these three notes are generally reminiscent of songs of small passerines. Notes of figures 5A and 5B do not always occur in sequence as shown. Figure 5C shows other *peep* notes, resembling the second component of figure 4B. Finally, 5D shows a note that is somewhat like that of a White-breasted Nuthatch (*Sitta carolinensis*) but is less nasal, in some ways reminding me of certain calls of small parrots in spectrographic representation (see Hardy, Condor, 65:169-199, 1963), although the parrot calls are noisier.

VOCAL BEHAVIOR

Like *Cyanocorax chrysops*, *C. mystacalis*, *C. dickeyi*, and *Calocitta formosa*, the Collared Jay has a bewilderingly large repertoire of calls. I have discussed only the

basic call types above. Except for calls shown in figure 1, all calls discussed have from three to five variants discernible to the ear and spectrographically. Unlike the species of *Cyanocorax*, however, but like *Calocitta*, the Collared Jay, when vocal at all, often seems to utter its entire repertoire in an almost endless combination of the components, *peeps* interspersed with *reeks!*, sudden *craahs* followed by snoring notes and the nuthatch-like call, and so on in infinite variation. Upon listening to the tape recording here described, I am reminded of the vocal behavior of the Yellow-breasted Chat (*Icteria virens*) and the Mockingbird (*Mimus polyglottos*), the latter especially when it is engaged in rendering less than high-intensity song. Thus, there is no song-like quality to the rendition, no pattern or linkage of the components, but merely a miscellaneous stream of utterances.

Careful study would almost certainly reveal that the calls of the Collared Jay have quite specific contexts and functions. Yet, I emphasize that based on evidence from recordings by Schwartz and my own observations, birds seemingly foraging normally and apparently not disturbed do utter the entire repertoire without any change of behavior or context of their activity.

Perhaps complex vocal repertoire and its rendition in the manner of the Collared Jay are related to structure of habitat. Richard Brewer, who read an early draft of this manuscript, commented in a letter: "I wonder if it would be a fair question to ask, not why the Collared Jay vocalizes as it does, but why [Magpie-jays], chats, Brown Thrashers, etc. all vocalize as they do? These are all forest edge species." The Collared Jay is not a forest-edge species, but the vegetational characteristic its habitat shares with the forms mentioned by Brewer is density, with thickets or other kinds of heavy understory. These might restrict visual communication and select for a subtle and complex form of vocal exchange.

We need to know more about the sociality of the Collared Jay before the above hypothesis can be explored fully. The Mexican and Central American species of *Cyanolyca* often live in dense habitat, and none possesses a complex repertoire (Hardy, 1964, *op. cit.*). Yet, there is evidence that all of these species are of low sociality (*i.e.*, pairs are strongly territorial) in the nesting season, as one of them, the Dwarf Jay, *C. nana*, certainly is according to my own observations, and that they are often solitary or in pairs or small loose flocks even in the nonbreeding season. Thus, regardless of habitat density, these species would not necessarily develop complex communicational means. If the Collared Jay is highly social throughout the year and thus requires some means of contact between each individual and all other members of its flock, the complex repertoire might for this reason be strongly selected for.

In the above-mentioned letter, Brewer poses another question: "Is there any evidence that Magpie-jays and Collared Jays flock with and gain benefit thereby from other species of birds?" The answer to this question is no, there is no evidence, but it may well prove to be the case when detailed studies of these two species in the wild are conducted. My own as yet uncompleted studies of *C. nana* reveal that it forages in multispecies flocks, especially with the wren, *Campylorhynchus megalopterus*, but also with other species (see Short, Wilson Bull., 73:341-346, 1961). Although as mentioned, Dwarf Jays have not evolved an elaborate vocabulary, the interspecies associational propensity certainly exists, perhaps, as suggested, remaining ineffective in encouraging complex repertoire in the jay due to its low sociality. If Collared Jays travel in multispecies flocks and need to maintain contact with other species, it might prove valuable for the birds to call in a variety of ways, in different frequencies, tonal combinations, and emphasizing different tones, pitches, and dura-

tions of calls. Each vocal component might then reasonably be assumed to communicate to affect a different associate in the multispecies flock.

PHYLOGENETIC AND SYSTEMATIC CONSIDERATIONS

I believe it likely that the cyanocoracine vocalizations found in the Collared Jay are primarily acquired and reflect ancestry. Alarm and flock social calls are certainly among the most primitive and widespread in the two tribes, and the cawing calls of cyanocoracines are even common to the Corvinae. Then, too, I find no simply definable aspects of the cyanocoracines or their habitats toward which the Collared Jay seems convergent that would be reflected in the adoption of such vocalizations. In fact, morphologically and in its montane temperate-forest habitat, the Collared Jay is unlike almost all cyanocoracines and is quite aphelocomine. Regarding social habits we know too little, and there is so much variation in the sociality of the various species now already studied that one cannot speak of convergence toward the cyanocoracines, except in those characteristics that I have used to define the tribe. If the Collared Jay possessed only aphelocomine alarm and flock social calls but had in addition some of the specialized calls of cyanocoracines such as the "squeaky gate" and "bell calls," one might make a slightly better case for convergence to explain their existence in the repertoire. But this is not the case.

The vocal repertoire of the Collared Jay is the only one known to me that bridges the gap between the two tribes of New World Jays. In avian taxonomic assemblages that have probably undergone most of their evolution and adaptive radiation within Pleistocene time, it is not surprising that "living links" between otherwise discrete higher taxa are often found. Indeed, one should expect most species in a given assemblage to exhibit one or more characteristics reflecting ancestral ties to other assemblages. Morphologically *C. v. merida* is strictly aphelocomine. In its vocalizations it possesses characteristic cawing and querulous nasal calls, plus the varied repertoire of the cyanocoracines. None of its other calls resemble the "squeaky gate" and "bell calls," some versions of which are found in most cyanocoracines. Thus it seems to be an aphelocomine species that bears resemblances to the hypothetical ancestor of the two tribes.

No cyanocoracine jay displays marked features of the aphelocomine stock. Although I have no field knowledge of *Cyanocorax heilprini* or *C. cyanomelas*, the evidence thus far accumulated from knowledge of *C. violaceus* (an obviously close relative of *heilprini*) in the wild, and from the literature on *cyanomelas*, suggests that no South American member of this tribe is comparably intermediate toward the aphelocomines. Although Steller's Jay, *Cyanocitta stelleri*, possesses certain vocalizations that sound somewhat like the typical alarm or flock social calls of aphelocomine jays, spectographic analysis has shown these to be downwardly inflected and otherwise similar in structure to cyanocoracine vocalizations.

SUMMARY

Cyanolyca viridicyana merida possesses a larger vocal repertoire than any other known for its tribe, Aphelomini, and is the only known species of New World jay to possess prominent vocal characteristics of both tribes. Because of this, it may be thought of as a living link between the Aphelomini and the Cyanoracini. *C. v. merida* also has calls in its repertoire that are uniquely unjaylike, and a vocal behavior suggestive of certain Mimidae and of *Icteria*, the Yellow-breasted Chat. This

jay utters most of its vocabulary in intermittent varied combinations, making determination of behavioral function or context of a given component impossible, especially in light of our current nearly complete lack of information concerning habits of the species.

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