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### Geographic Variation in the Bell Calls of the Blue Jay

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Bay (Todd 1943, Manning 1952, Godfrey 1966). The nest (7 cm internal diameter) was in a damp marsh with a fairly heavy cover of grasses and sedges (predominantly *Carex*, *Juncus*, and *Scirpus* spp.). It was concealed by the previous year's growth of overhanging grass and was supported 5 cm above water that was 5–10 cm deep. The nest contained nine cold eggs, although an adult rail was flushed very close to the nest. No rails were seen when the nest was next visited on 20 June, although it then contained 10 warm eggs. When checked at 1950 on 30 June, one egg was pipping, and the others were warm but unbroken. At 1645 on 1 July, the last chick had just emerged from its egg, which still lay in the nest. Hatching thus occurred within 21 h. Assuming that the last egg was laid on 13 June and that incubation began immediately, the incubation period from the laying of the last egg to the hatching of the last egg was about 18 days. The average weight of the nine eggs decreased from 6.9 g (range 6.4–7.4, SD = 0.36) on 12 June, just prior to incubation, to 5.6 g (range 5.3–6.1, SD = 0.22) on 30 June, just prior to hatching.

Ripley (1977), Harrison (1975), and other authors give the incubation period of the Yellow Rail as "unknown." Lane (1962) reported the incubation period of a clutch of nine eggs near Brandon, Manitoba as "13 days, plus a few extra hours in the case of the final egg," which differs markedly from the period of 18 days that we recorded. Lane's methods appear similar to our own, and the difference is not readily explainable. Stalheim (1975) reported an incubation period of about 17 days for captive Yellow Rails. The wide variation in incubation periods reported for other North American rails, such as the Virginia Rail (*Rallus limicola*) and Sora (*Porzana carolina*) (e.g. Godfrey 1966, Zimmerman 1977), appears to be questionable (see Nice 1954).

Terrill (1943) observed the hatching of a clutch of eight Yellow Rail eggs within 20 h near Gaspé, Quebec and suggested that incubation commenced after the last egg was laid. Terrill's suggestion is confirmed by the present study, where the eggs were cold prior to completion of the clutch, the entire clutch hatched within a 21-h period, and the last egg observed to hatch was not the last one known to be laid.

We wish to thank Vicki L. Sinclair for her patient assistance with the fieldwork. We also thank S. G. Curtis, W. E. Godfrey, J. A. Hagar, P. C. Smith, and two reviewers for their helpful comments on this paper.

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### Geographic Variation in the Bell Calls of the Blue Jay (*Cyanocitta cristata*)

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Preliminary field observations suggested to us that one class of Blue Jay (*Cyanocitta cristata*) vocalizations, the bell calls (Bent, A. C. 1946, U. S. Natl. Mus. Bull. 191: 32–52; Hardy, J. W. 1961, Kansas Sci. Bull. 42), consisted of several discrete types, each of which was limited in its geographical distri-

bution. Accordingly, the discreteness of the call types and the stability of their geographical distribution was checked by recording vocalizations at nine sites in and within 50 km of the city of Worcester, Massachusetts, on a regular schedule from 5 June 1975 to 24 June 1976.

In all, 28 types of bell calls were identified; six examples are given in Fig. 1. Call-type descriptions were based upon visual analysis of the arrangement of call notes, measurements of call durations, and measurements of the midpoint pitches of the horizontal "lines" of notes characteristically appearing on sonagrams of bell calls (produced on a Kay Elemetrics 6061-B Sonograph). Call types were described in terms of a hierarchical classification system. They were first broadly classified into calls made up of only one line (monotone bell calls) and calls made up of two or more lines (polytone bell calls). Monotone bell calls were further classified into calls containing 1, 2, 3, or 4 call notes. Polytone bell calls were further classified according to the temporal arrangement of call notes, forming subgroups of calls with such note patterns as "hi-lo, hi-lo-lo, lo-hi-lo," etc. Assignment of calls to call types was checked by an inter-observer reliability test and found to be completely reliable.

Each type of bell call was found to be limited in its geographic distribution; that is, no call type occurred in more than four out of the nine locations. Each call type was recorded on a minimum of five separate encounters at each of the locations where it was observed. From two to six call types could be heard at each location. Many contiguous or nearby locations shared some of the same call types, but no two locations shared identical sets of call types.

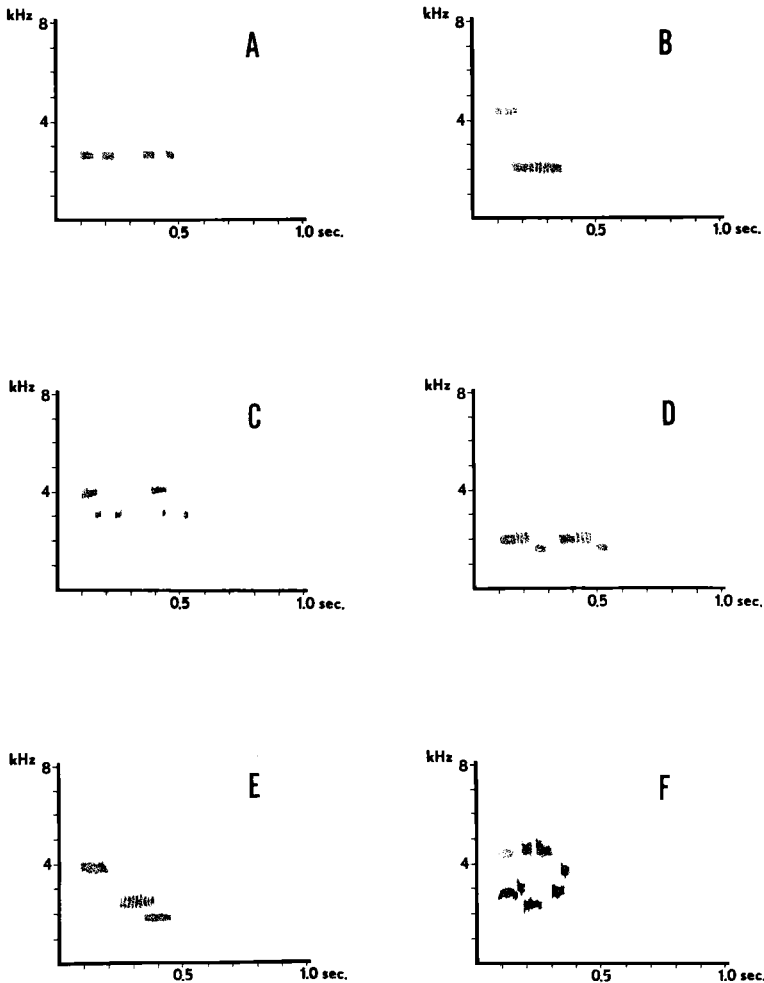


Fig. 1. Sonogram tracings of six forms of bell calls observed in the study: A, four-note monotone; B, high-low; C, paired high-low-low; D, high-low-high-low; E, high-middle-low; F, low-high.

Field observations suggested that the bell call types were not uniquely associated with particular individual jays. For 15 call types at least 1 observation was made of 2 or more jays simultaneously uttering the same type of bell calls. For 20 call types, individual jays were observed switching from one call type to another while under continuous observation. No individual, however, was ever heard to utter more than two bell call types in a single sequence of calling.

The results suggest that Blue Jay bell calls are a dialect vocalization in the sense defined by Nottebohm (1969, *Condor* 71: 299–315). Bell calls are dialect-like in that they can be organized into discrete categories that are distributed over a limited part of the Blue Jay's range. The variety of seasonal and social circumstances in which bell calls occur in Blue Jays suggests that bell calls may have a broader function than that of dialect vocalizations in classical territory-defending species. We suspect that bell calls may provide identification information by which individuals decide whether or not to cooperate with one another in the various circumstances in which the calls are employed. Received 29 November 1977, accepted 9 January 1979.

### The Paint-billed Crake in Guyana

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On 8 August 1977, we collected an adult female Paint-billed Crake, *Neocrex erythrops olivascens*, on the grounds of the Rice Research Station at Burma of the Mahaicony and Abary Rice Development Scheme (MARDS), Guyana (6°28'N, 57°45'W). It was found among bamboo grass (*Hymenachne amplexicaulis*). The specimen weighed 43 g, had an enlarged ovary, wing of 100 mm, tarsus of 28 mm, and culmen of 16 mm. It is No. 1188, Miami University Museum of Zoology.

The Paint-billed Crake is uncommon but widespread east of the Andes. Because it has been recorded in Colombia, Venezuela, Surinam, eastern Brazil, Paraguay, eastern Bolivia, and northwestern Argentina (Blake 1977, *Manual of neo-tropical birds*, v. 1, Chicago, Illinois, Chicago Univ. Press, p. 510), its presence in Guyana would be expected. Blake (1977) does not include Guyana in the range of this form, nor does Snyder (*The birds of Guyana*, 1966, Salem, Massachusetts, Peabody Mus.) mention it in her hypothetical list, where she rejects doubtful records and includes species from surrounding countries that should occur in Guyana.

The references that include *Neocrex erythrops* as occurring in Guyana require elaboration. The basis for these records is a single mounted specimen taken by Schlegel (1865, *Mus. d'Historie Naturelle des Pays-Bas*, 5, Ralli, p. 37), which is presently housed in Leiden, Netherlands. The locality "Guyane" was apparently added later (G. F. Mees pers. comm.). In those years Guyane (Guiane) included the entire coastal plateau between the Orinoco and Amazon rivers, subsequently British, Dutch, French, and Portuguese Guiana (Malte-Brun 1827, *Dictionnaire Geographique portatif, contenant la description generale et particuliere des cinq parties du monde connu*, Paris, part I, p. 316). Thus, the exact collection locality of Schlegel's mounted specimen is not known. Apparently Schlegel also listed many specimens of birds from Surinam without giving exact localities (Haverschmidt 1968, *Birds of Surinam*, Wynnewood, Pennsylvania, Livingston Publ. Co., p. 429). Penard and Penard [1908, *De Vogels van Guyana* (Suriname, Cayanne en Demerara) Geleverd Door N.J. Boon te Amsterdam, v. 1, p. 213] cited Schlegel's specimen but gave the form as occurring in "Guiana," the area apparently encompassing Surinam, French Guiana, and the Demerara Coast along present Guyana. Hellmayr and Conover (1942, *Catalogue of birds of the Americas*, Field Mus. Nat. Hist. Zool. 13: 391) misquoted Schlegel's locality of Guyane as "Guyana." They were the source for inclusion by Ripley (1977, *Rails of the world*, Boston, Massachusetts, David R. Godine, p. 229) of the Paint-billed Crake into the Guyana avifauna. Ripley spelled it "Guayana," however. To our knowledge, our specimen is the first verifiable evidence of the species in Guyana.

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