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Intergradation Between the Bush-Tanagers

Chlorospingus punctulatus and C. ophthalmicus in Western Panama

Aves: Thraupidae

STORRS L. OLSON

Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, USA

The taxa included under Chlorospingus ophthalmicus (Common Bush-Tanager) show complex geographic variation throughout the vast range of the species from Mexico to Argentina. For example, there are 10 named subspecies divided into at least 14 discrete populations in Colombia and Venezuela alone (Olson 1983). Three taxa in this complex have been named from western Panama. One of these, C. punctulatus Sclater and Salvin 1869, found in the provinces of Veraguas and Cocle (Fig. 1), is sufficiently distinct from the others in its very dark cap and more intense coloration that it has almost always been given the status of a separate species (e.g. Hellmayr 1936 [and all previous authors], Eisenmann 1955, Storer 1970), or has been maintained as its own subspecies “group” (AOU 1983).

The subspecies C. o. regionalis Bangs 1902 was shown to occur (Olson 1981) only on the eastern slope of Volcán de Chiriquí (Fig. 1), mainly in the vicinity of the town of Boquete. This form is decidedly more richly colored than C. o. regionalis and was considered to show some approach to the coloration of C. punctulatus (Olson 1981).

These bush-tanagers are common and conspicuous where they occur and the absence of specimens between western Chiriquí and central Veraguas is probably an artifact of collecting due to lack of roads in the mountains in the area. Construction of an oil pipeline and an accompanying highway (often known as the Fortuna or “oleoducto” road; Ridgely and Greeny 1989), from Gualaca on the Pacific slope of Chiriquí to Chiriqui Grande on the Caribbean slope of Bocas del Toro, provided access to mountainous habitats some 25 km east of the Boquete area. Birds of the C. ophthalmicus complex were observed along this road and referred to the subspecies noviclus by Ridgely and
Gwynne (1989:405), most likely on geographical grounds. In 1990, I examined a specimen of this species labelled “Fortuna” in the Gorgas Memorial Laboratory in Panama City, collected 13 February 1976 by Rodolfo Hinds, that I recognized as distinct from novicius. Smithsonian field parties then obtained additional specimens near Fortuna in 1990 and from just over the continental divide in Bocas del Toro in 1991.

In general, these specimens are intermediate in plumage characters between punctulatus and novicius, but are more similar to punctulatus in having the crown and sides of head very dark. The crown color varies individually, with some being more brown, although the crown is never as blackish as in punctulatus. The throat and chin are more heavily speckled than in novicius, but less so than in punctulatus, and the bases of the feathers are paler, more whitish, than in punctulatus, thus approaching novicius. The lower throat and upper breast are less intensely orange than in punctulatus, but not as dilute as in most specimens of novicius.

The population of bush-tanagers reported here is more similar to C. punctulatus than to the less-intensely colored forms novicius and regionalis, found only 25 to 30 km distant on the slopes of Volcán de Chiriquí. Although the species has not yet been collected anywhere between Fortuna and Veraguas, birds from most of this area will probably prove to be similar to or inseparable from punctulatus. Thus, the transition from dark-capped punctulatus to light-capped regionalis takes place abruptly over a narrow band probably less than 50 km wide, within which complete intergradation may be expected. Thus, the population to the west known as “novicius” and the newly sampled populations to the east reported here probably represent the extremes, both morphologically and geographically, of this narrow band of intergradation.

From the evidence presented here, it seems clear that punctulatus is not specifically distinct from other forms of the Common Bush-Tanager occurring to the west and north, and should be regarded as a subspecies of C. ophthalmicus. Although the birds from the Fortuna area are distinguishable from other named subspecies, I believe that it is best to regard this population and that represented by “novicius” as part of a steep cline of intergrades between C. o. punctulatus and C. o. regionalis that do not deserve separate nomenclatural status.

C. o. punctulatus: VERAGUAS: Cordillera del Chucú, USNM 62013 (syntype); Santa Fé, AMNH 187972; Chitra, AMNH 246541, 246552, 246553, 246556, 246561. COCLÉ: Cascajal, USNM 150875.

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Effect of Handling Time and Freezing on Catabolic Enzyme Activity in House Sparrow Pectoralis Muscle

TIMOTHY P. O'CONNOR1 and TERRY L. ROOT2

1Department of Biology, University of Michigan, Ann Arbor, Michigan 48109, USA; and
2School of Natural Resources, University of Michigan, Ann Arbor, Michigan 48109, USA

Activities of certain catabolic enzymes have been used as indicators of the metabolic capacity of a tissue (Marsh 1981). For example, citrate synthase (CS) activity has been used to indicate the capacity for oxidation of acetyl-CoA in the citric acid cycle, and β-hydroxacyl CoA-dehydrogenase (HOAD) has been employed as an indicator of tissue capacity for fatty acid oxidation (e.g. Bass et al. 1969, Marsh 1981, Wickler 1981, Marsh and Dawson 1982, Yacoe et al. 1982, Olson 1987, 1990, Carey et al. 1989). In some studies enzymatic-activity determinations have been carried out on freshly dissected tissues (e.g. Bass et al. 1969, Marsh 1981, Wickler 1981, Marsh and Dawson 1982, Yacoe et al. 1982, Olson 1987, 1990, Carey et al. 1989). In others, tissues were dissected out of the organism, frozen, stored at approximately −70°C, and then later thawed and analyzed (e.g. Olson 1987, 1990, Olson et al. 1988). The latter protocol allowed investigators to capture and dissect organisms in the field, and then store tissues for subsequent analyses. One of the variables inherent in such a protocol is the handling time between tissue dissection and freezing. We refer to this period as the “time to freezing.”

Another variable is the extent to which freezing affects the enzyme activities. Srere (1969) reported that more CS can be extracted from frozen than fresh tissue. In order to address these variables, we examined the relationship between time to freezing and the activity of both CS and HOAD in the pectoralis muscle of the House Sparrow (Passer domesticus). We also compared the enzymatic activities of freshly dissected tissues with those of tissues that had been frozen for storage.

We mist netted 19 House Sparrows in Ann Arbor, Washtenaw County, Michigan in October 1989. Within 4 h of capture, individuals were sacrificed by thoracic compression, and pectoralis muscles were quickly removed. Once removed each muscle was arbitrarily placed into one of six experimental groups. Each group was composed of five pectoralis samples, with muscles from the same individuals being placed in different groups. Five of the experimental groups included muscles that were frozen, while the sixth group included freshly dissected muscles. The freshly dissected muscles were homogenized immediately, and the homogenate was then sonicated in order to lyse.