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MARA A. MCDONALD, *Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801; and Dept. Zoology, Univ. Florida, Gainesville, Florida 32611.* (Send reprint requests to SREL.) *Received 10 Sept. 1986, accepted 24 Feb. 1987.*

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Expansion of the zone of hybridization of Northern Flickers in Alberta.—Hybridization between the eastern yellow-shafted form of the Northern Flicker (*Colaptes auratus auratus*) and the western red-shafted form (*C. a. cafer*) has been well documented for the Great Plains of the United States (Short 1965, Anderson 1971, Moore and Buchanan 1985). In the Great Plains, the zone of hybridization has remained essentially stable over the past 100 years (Moore and Buchanan 1985); however, contact between yellow- and red-shafted birds farther north has been little studied (Rising 1983). Short (1965) examined only 45 specimens in his analysis of the distribution of parental and hybrid forms of flickers in Saskatchewan and Alberta, Canada. Here we report on the examination of 98 Northern Flicker skins collected during the breeding season (1 May to 31 July) between 1891 and 1984 in Alberta. A maximum of 10 of these skins were included in the Short (1965) analysis; therefore at least 88 provide additional data on the delineation and temporal stability of the hybrid zone in Alberta.

Specimens were divided into two groups: (1) those collected prior to 1960 (1891–1957) and (2) those collected after 1960 (1961–1984). These groups facilitate comparison with Short's (1965) work and allow us to examine changes in the hybrid zone over time. Following Short (1965), we scored 6 plumage color characters for each specimen on a scale of 0 (pure *auratus*-like) to 4 (pure *cafer*-like). The characters examined, with parental states given in parentheses in the order *auratus-cafer* were crown color (gray-brown), ear covert color (tan-gray), throat color (tan-gray), nuchal patch (present-absent), shaft color (yellow-salmon) and malar color (males only, black-red). Scores of 1–3 represent proportionally intermediate states. Scores were summed across the 6 plumage characters to yield a hybrid index score. All scores from female specimens were converted to a scale of 24 to make them comparable to those of males. These scores range from 0 (*auratus*-like) to 24 (*cafer*-like). Specimens were grouped according to collection sites, and scores were then plotted on a map of Alberta (Figs. 1A and 1B).

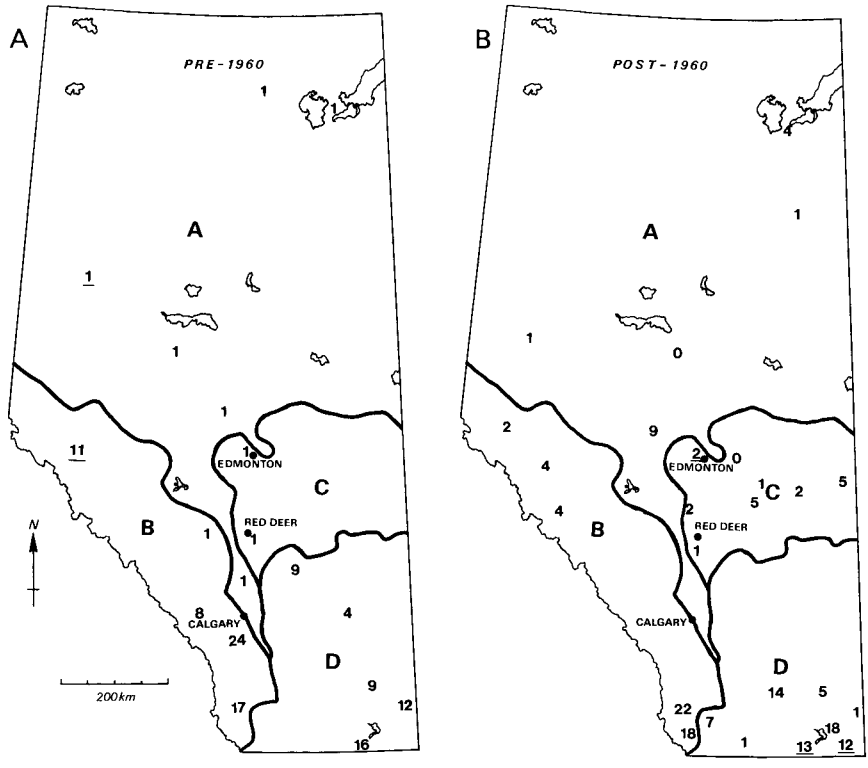

FIG. 1. Mean hybrid index scores of Northern Flicker specimens collected (A) prior to 1960, and (B) after 1960. Underlined values denote localities where five or more specimens have been obtained. Habitat zones are marked by letters: A—Boreal forest, B—Montane (includes foothills), C—Aspen parkland, and D—Grassland.

Of the 54 specimens that had been collected prior to 1960, flickers with intermediate or strong *cafer* characteristics generally occurred only in the Rocky Mountains and in southern Alberta, south of Red Deer (Fig. 1A). These two areas formed the primary area of hybridization between the two subspecies, with only one "pure" *cafer* (a female from near Calgary) and two "pure" *auratus* (a male and a female from near Red Deer) collected. As Short (1965) concluded, north of Red Deer a massive *auratus* population showed little or no effects of hybridization with *cafer* individuals.

Forty-four specimens collected subsequent to 1960 suggest that the *cafer* population is beginning to influence the northern *auratus* population (Fig. 1B). Several specimens collected north of Red Deer scored greater than 2 on the hybrid index (the highest score attained in specimens collected in this area prior to 1960). Of particular interest are two males collected in Whitecourt (160 km NW of Edmonton) and at Fort Chipewyan (600 km NE of Edmonton), respectively. The Whitecourt male (score = 9, National Museum of Canada 52900) had a brown crown with a gray hind neck, traces of gray in its ear coverts, mixed throat color, and traces of a nuchal patch. The Fort Chipewyan bird (score = 4, Prov. Mus. Alberta 80.64.149) had an intermediate crown color and red and black malar feathers in about equal

proportions. These specimens, and the significantly ($t = 2.11$, $P < 0.05$, N = 34) higher hybrid scores obtained from birds north of Red Deer and east of the mountains in the post-1960 sample ($\bar{x} = 2.00$, N = 19) compared to the pre-1960 sample ($\bar{x} = 0.77$, N = 17) suggest that *cafer* characteristics are spreading into the northern *auratus* population.

As Moore and Buchanan (1985) found in the U.S. Great Plains, we find that flicker hybrid scores are unchanged in the grasslands of southern Alberta. In the Rocky Mountain regions there is no evidence of change, but recent material is lacking from the northern Rockies because collecting is prohibited in the National Parks in that region. The areas of greatest change are the aspen parkland of east-central Alberta and the mixed forest to the north where *cafer* characteristics are more evident in the post-1960 sample than in the pre-1960 sample.

Expanding the pre-1960 sample from 22 (Short 1965) to 54 produced no substantive change in the boundaries of the hybrid flicker zone, and the post-1960 movement of *cafer* characteristics into the northern (above Red Deer) *auratus* population should not be dismissed as a artifact of increased sampling effort.

Unfortunately, there is no obvious explanation for recent changes in the flicker hybrid zone. If secondary contact was established as long ago as 10,000 years (Moore and Buchanan 1985, but see Rising 1983:151), there has been ample time for introgression of *cafer* genes into the northern *auratus* population. However, in the last 20 years, increased logging and clearing of pine forests along the northern foothills has produced more open habitat, perhaps facilitating movement of *cafer* into the northern parkland. In summary, the boundary between the northern *auratus* and western *cafer* flickers appears to be changing in central Alberta. The movement of *cafer* characteristics into the northern *auratus* area appears quite recent and should allow for an examination of the process of secondary contact.

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W. BRUCE MCGILLIVRAY AND GLORIA C. BIERMANN, *Dept. Ornithology, Provincial Museum of Alberta, Edmonton, Alberta T5N 0M6, Canada.* *Received 17 Nov. 1986, accepted 4 Mar. 1987.*