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ADDITIONAL EVIDENCE OF SONG-MISPRINTING IN THE WHITE-CROWNED SPARROW

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Song variation and song development in the sedentary populations of the White-crowned Sparrow (*Zonotrichia leucophrys nuttalli*) have been studied by a number of investigators (Marler and Tamura, 1962, 1964; review in Baptista, 1975). Baptista (1974, Ms) has also studied song dialects of the migratory subspecies, *Z. l. pugetensis*.

An occasional migrant White-crowned Sparrow may remain in its winter quarters and sing through the following spring (Blanchard, 1941). A few sedentary White-crowns (*nuttalli*) may sing songs learned from winter visitants belonging to the subspecies *pugetensis* (Baptista, 1973, 1974).

At 1500 on 5 June 1974, at the Berkeley Marina, Berkeley, California, we were attracted to the song of a territorial White-crowned Sparrow that was obviously aberrant for that region. Closer auditioning revealed that this bird was singing a song typical of some *pugetensis* that breed in Oregon and winter in the San Francisco Bay region of California. The question was raised anew as to whether this individual was an overwintering migrant that had remained in Berkeley through the following spring and summer, or conversely was a resident *nuttalli* that had learned a theme from a visiting *pugetensis*.

We recorded a long series of songs from this bird (henceforth designated as P8), watched it for two hours and made notations of its songs and singing behavior, then captured it. A cloacal protuberance indicated that it was a male. An intense search of 3.5 hr on 5-6 June revealed no other White-crown at this locality. P8 appeared to be unmated. We describe herein his songs and discuss his probable taxonomic status.

DESCRIPTION OF SONGS

A song typical of *nuttalli* from Berkeley is illustrated in Figure 1A. This begins with two whistles and ends with a long two-parted trill as described by Marler and Tamura (1962). Figure 1B illustrates a spectrogram of a theme sung by P8 in the field. This begins with a whistle, followed by a short trill, then a buzz, and ends in a long trill. Songs of this type are typical of *pugetensis* in many populations in Oregon (see Fig. 1 in Baptista, 1974; and Ms). Sometimes P8 sang themes with two short introductory

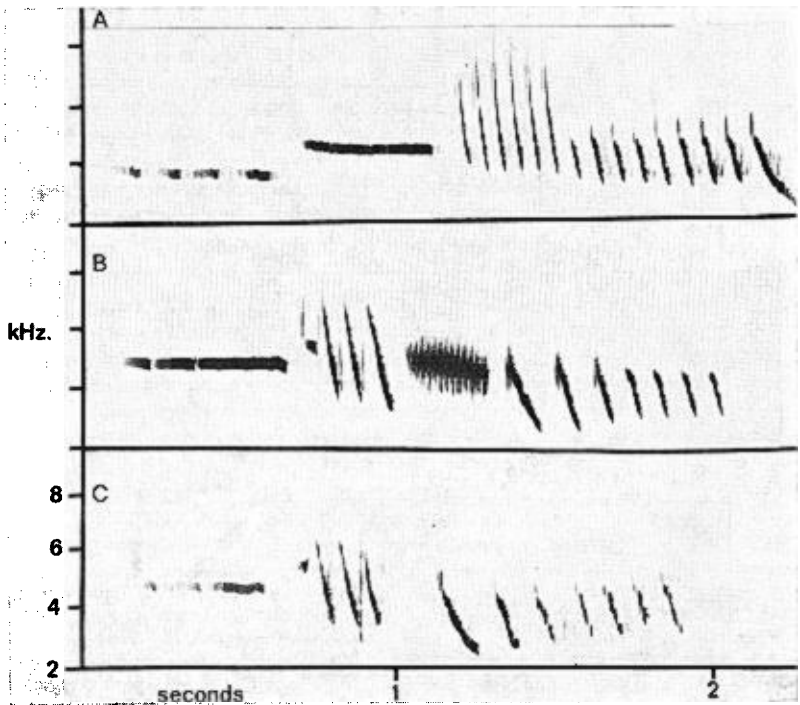


FIGURE 1. A. A typical *nuttalli* theme from Berkeley, B. *Pugetensis* theme sung by P8, C. Variant of theme B sung by P8. Because the buzz is absent, this theme is easily mistaken by audition for a local *nuttalli* theme.

whistles (not illustrated). Only one other bird (Fig. 11 in Baptista, 1974) recorded previously in Berkeley sang themes similar to P8's.

We thought we heard P8 sing a local Berkeley theme as well, but never recorded it during two hours in the field on 5 June. P8 was subsequently kept under observation in an aviary in the Moore Laboratory of Zoology, Occidental College. Song was sporadic in captivity. On 20 June we recorded a variant song (Fig. 1C) lacking the buzz normally present in the introduction (Fig. 1B). The syllables following the whistle in Figure 1C match the syllables in 1B in morphology, pitch, and pitch changes. To stimulate more singing P8 was injected with 5.5 mg of testosterone suspended in peanut oil (G. D. Searle, Sc-16148, 50 mg/cc) on 2 October and kept in Baptista's home. Loud and long song bouts were sung at dawn and at night from 6-29 October when our observations terminated. No new themes were recorded or detected.

White-crowns with bivalent repertoires are known to match song themes played from a tape-recorder (Baptista, 1975). *Nuttalli* themes recorded from Berkeley were played to P8. After

injection with testosterone, P8 responded to playback of recorded song with alarm calls, aggressive trills (spectrograms in Marler, 1970; Kern and King, 1972), and whisper songs. No *nutalli* themes were elicited, further suggesting that the *pugetensis* motifs recorded in the field were all that were stored in its song template.

It is likely, therefore, that what we thought was a local *nutalli* song heard in the field was, in fact, the variant theme in Figure 1C. A single whistle followed by a trill is typical of the songs of many individuals in Berkeley (P4 in Baptista, 1974; 1975) so that the unaided ear could easily mistake theme C (Fig. 1) for a *nutalli* theme. There are noticeable differences in the fine structure of the syllables terminating the trills in themes A and C (Fig. 1), but we were not able to distinguish these aurally. Baptista (Ms) has recorded many individuals in Oregon singing theme B (Fig. 1); however, the variant theme C has never before been encountered in the field.

TAXONOMIC DIAGNOSIS

Plumage.—P8 was compared with series of *nutalli* and *pugetensis* in the Museum of Vertebrate Zoology of the University of California, Berkeley. All the skins examined were taken on their breeding grounds at approximately the same time of year (late May through the first two weeks of June) and were in comparable state of feather wear as P8.

P8 matched the series of *nutalli* in being darker in back, breast, and belly coloration than the series of *pugetensis*. Moreover, the white stripes on the crowns of the *nutalli* and P8 were not as bright as the series of *pugetensis*, a character used by Blanchard (1941) to separate the two races.

Additionally, P8 exhibited an incompletely molted crown which was black-and-white in front and brown posteriorly (crown class 4 of Banks, 1964). There were also two brown feathers above its right eye, and one above its left lore. Incomplete coronal ecdysis in first-year birds is not uncommon among *nutalli*, but rare or absent in populations of *pugetensis* (Banks, 1964; Ralph and Pearson, 1971; Baptista, 1974).

Measurements.—Mensural characters of P8 were as follows: bill 8.64 mm, tarsus 24.5 mm, wing 72 mm (slightly worn at tips), weight on capture 26 g, cloacal protuberance 9 mm. The tail was very worn and was not measured.

The bill of P8 is closest to *nutalli*, the dividing line set by Banks (1964) to separate *pugetensis* from *nutalli* being 7.9-8.0 mm. Tarsus length is also closest to *nutalli*; Banks (1964) found that most *pugetensis* had tarsi 23.1 mm or less and most *nutalli* had tarsi 23.3 mm or more. Although wing length cannot be used as a reliable character separating northern from southern populations of White-crowns, it is noteworthy that wing length of P8 is close to Banks' (1964) mean for populations from East San Francisco Bay, namely 72.46 ± 1.56 SD.

Thus, based on coloration and incomplete molt of the crown, the dark coloration of the body, bill and tarsal length, we feel that

P8 is most likely a local *nutalli* that had learned the song from an overwintering *pugetensis*.

This is the second record of a *nutalli* singing a theme typical of populations of *pugetensis* from southern Oregon, and the seventh of a sedentary White-crowned Sparrow "misimprinted" with the song of a migrant hatched in populations to the north. The possible circumstances whereby song misimprinting may occur and the evolutionary implications of these data have been discussed previously (Baptista, 1974).

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