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SONGS OF TWO MEXICAN POPULATIONS OF THE WESTERN FLYCATCHER *EMPIDONAX DIFFICILIS* COMPLEX[1]

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Key words: Song; Mexico; Western Flycatcher; Pacific-slope Flycatcher; Cordilleran Flycatcher; Empidonax difficilis; Empidonax occidentalis.

Johnson (1980) provided a detailed treatment of the Western Flycatcher (*Empidonax difficilis*) complex, and more recently Johnson and Marten (1988) recommended that coastal and interior populations of *E. difficilis* be considered specifically distinct. This course was followed by the American Ornithologists' Union (1989), naming coastal birds the Pacific-slope Flycatcher (*E. difficilis*) and interior birds the Cordilleran Flycatcher (*E. occidentalis*). Johnson's (1980) analysis of vocalizations lacked the advertising songs from several key areas, and included none from Mexico. Recordings from two areas would be of particular interest: (1) interior-breeding birds in Mexico, which Johnson (1980) suggested might not have a complete advertising song; and (2) the distinct population (*E. d. cineritius*) in the Cape District mountains of southern Baja California which was given "megasubspecies" status by Johnson (1980).

During recent field work, one of us (Howell) recorded the advertising songs of birds from both these areas; they are described here to contribute to our understanding of this interesting complex. Vocalizations were recorded on a Sony TCS 430/450 cassette-recorder using a Radio Shack Electret tie-pin microphone mounted in a plastic funnel, and analyzed on a Kay 7029A sound spectrum analyzer. As in Johnson (1980), measurements were made from the single clearest recording from each bird. Although our sample sizes are very low, advertising songs in the *E. difficilis* complex tend to be similar over broad geographic areas (Johnson 1980), so recordings of single birds can be quite meaningful in a study of geographic variation.

E. d. cineritius: this bird is common in the fairly arid pine-oak forests of the Sierra Laguna (= Sierra Victoria), southern Baja California. Two singing individuals were tape-recorded at the northern end of La Laguna meadow on 9 and 10 June 1991; representative songs from each individual are shown in Figure 1 (A and B). In the field, the songs clearly recalled those of birds in coastal California, but they are lower pitched (cf. Johnson 1980:fig. 28, Santa Barbara sample), particularly syllable 1 (Table 1). Also, the peak of syllable 2 is not as acute as in typical coastal songs, being similar in this respect to songs from the California Channel Islands population. Channel Islands birds also tend to have low pitched songs, although not as low as the Sierra Laguna birds (Table 1). Syllable 3 is clearly typical of coastal populations (Johnson 1980:fig. 26).

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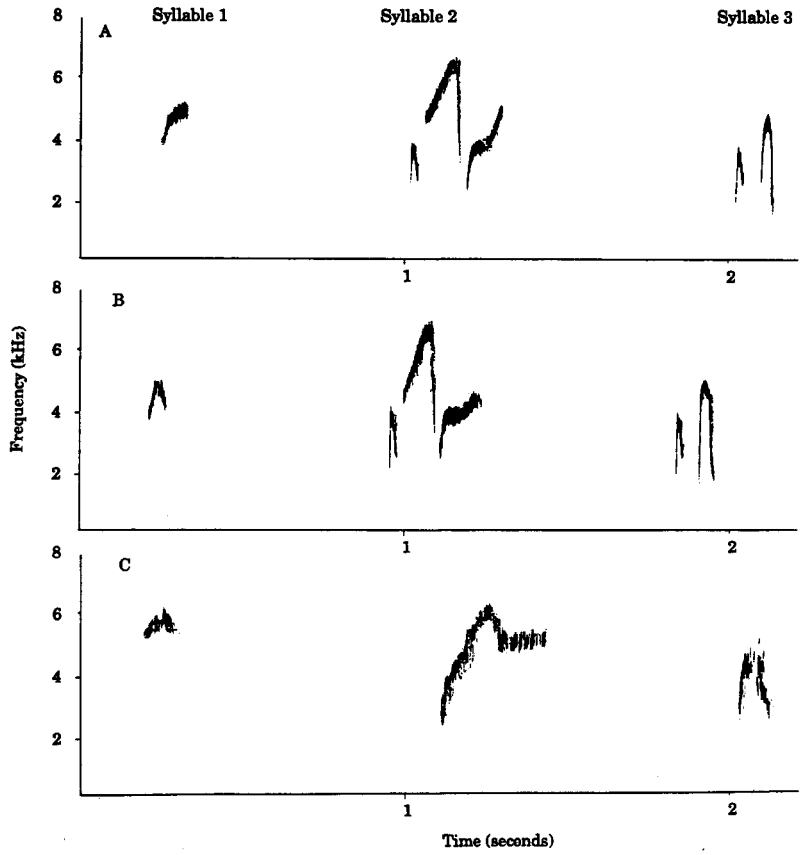

FIGURE 1. Sound spectrographs of advertising songs of Western Flycatchers in Mexico. A and B: Pacific-slope Flycatchers, Sierra Laguna, Baja California Sur; C: Cordilleran Flycatcher, Tlanchinol, Hidalgo.

Morphologically, Johnson (1980) found *E. d. cineritius* to be clearly allied to other coastal populations, grouping close to the populations from Sierra San Pedro Martir (northern Baja California) and the Channel Islands; its song supports this relationship. The male position notes recorded from Sierra Laguna (Fig. 2) are similar to those of mainland coastal populations rather than the simplified calls of Channel Islands birds (Johnson 1980:fig. 29).

E. occidentalis: the song in Figure 1C was recorded on 9 June 1990 in humid evergreen forest (cloud forest) at 1,500 m elevation, 5 km N of Tlanchinol, in the northern part of the state of Hidalgo. Cordilleran Flycatchers were common there and at least one other was heard singing. Howell also heard several singing Cordilleran Flycatchers in the Sierra Madre Occidental of Chihuahua in mid-July 1991 and noted that their song recalled that of the Hidalgo birds and birds in southern Arizona. Measurements taken from the song in Figure 1C are similar to those of songs recorded by Johnson

TABLE 1. Measurements of advertising songs of Western Flycatchers in Mexico and southwestern United States.[1]

	Mean frequency syllable 1	Frequency spread part 2, syllable 2	Frequency spread part 3, syllable 2	Mean frequency syllable 3
Sierra Laguna A	4.709	4.589	2.913	4.621
Sierra Laguna B	4.469	4.342	2.123	4.565
Santa Barbara[2]	5.960	4.000	2.300	5.320
Channel Islands[2]	5.282	3.964	2.036	4.900
Tlanchinol, Hidalgo	5.523	1.437	0.583	4.070
SE Arizona[2]	5.614	2.086	0.843	4.129

[1] Measurements based on Johnson's (1980) Table 2, all in kilohertz. Measurements of Mexican songs based on one song from each individual.
[2] Population mean from Johnson (1980:fig. 28).

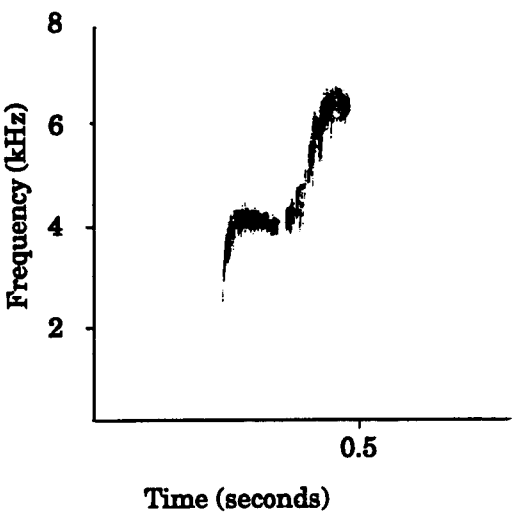

FIGURE 2. Sound spectrograph of male position note of Pacific-slope Flycatcher from Sierra Laguna, Baja California Sur.

(1980) in southeastern Arizona (Table 1), although the frequency spread of the descending portion (part 2) of syllable 2 is much narrower. Thus, Cordilleran Flycatchers in southern Mexico seem closely allied by song-type to those 1,200 km to the north in the interior southern United States, and their advertising songs show little gradation toward the songs given by the Yellowish Flycatcher (*E. flavescens,* Johnson 1980:fig. 27), a sibling species breeding as close as 500 km to the Hidalgo site. Recordings of advertising songs of Cordilleran Flycatchers from Oaxaca and of Yellowish Flycatchers from southeastern Veracruz or southeastern Oaxaca, i.e., where these species' ranges approach most closely, would further clarify this situation (Johnson's northernmost recordings of the latter species came from Nicaragua).

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THE INFLUENCE OF GROUP SIZE ON VIGILANCE IN CAPTIVE-RAISED RING-NECKED PHEASANTS[1]

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Key words: Behavior; focal analysis; foraging; groups; Phasianus colchicus; *Saskatchewan; ring-necked pheasants; vigilance.*

Two of the main environmental influences on the evolution of animal aggregations are thought to be food availability and predation pressure (Bertram 1980). Group formation is hypothesized to be a means by which individuals can exploit uneven food supplies (e.g., information-transfer; Ward and Zahavi 1973), minimize the risk of predation through dilution (Hamilton 1971), or increase group vigilance (Abramson 1979). These ideas have been used to explain the function of groups in many different animals, e.g., communal roosts of birds (Weatherhead 1983), fish schools (Brown and Downhower 1988), and maternity colonies of bats (Kunz 1982).

Evaluating the function of aggregations should provide insight into the degree of food availability and predation pressure to which an animal is subjected. For example, Bertram (1980) showed that although individual Ostriches (*Struthio camelus*) spent less time scanning when in groups, overall vigilance (proportion of time when at least one bird scanned) increased with group size. If, by being in larger groups, individual

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