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SONG DESCRIPTION OF THE HOUSE WREN (*Troglodytes aedon*) IN TWO POPULATIONS OF EASTERN ARGENTINA, AND SOME INDIRECT EVIDENCES OF IMITATIVE VOCAL LEARNING.

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ABSTRACT: The song of the House Wren *(Troglodytes aedon)* in two eastern Argentina areas (Luján and Magdalena) is described. Song is typically composed by different syllable types repetitively delivered, thus conforming phrases. There is a significant difference in the mean number of syllable types per song between Magdalena and Luján poulations. This difference is associated with the tendency in Magdalena's songs to be shorter and with fewer syllables than the Luján ones. This report critically discusses current evidence of vocal imitation learning, and offers some new data concerning this ability in *T. aedon*, based on the observation of intraspecific song sharing of interindividual variable syllable types.

RESUMEN: Se describe el canto de la Ratona *(T. aedon)* en dos localidades del este de la Argentina (Luján y Magdalena). El canto de esta especie está compuesto por diferentes tipos de sílabas presentados de manera repetitiva, constituyendo frases. Existen diferencias significativas en el número medio de tipos silábicos que componen el canto entre las poblaciones de Magdalena y Luján. Estas diferencias están asociadas con la tendencia de los cantos de Magdalena a ser más cortos y con menos sílabas que los de Luján. Se discuten críticamente las evidencias actuales sobre el aprendizaje vocal por imitación y se ofrecen nuevos datos sobre esta habilidad en *T. aedon*, basados en la observación de tipos silábicos muy variables, compartidos entre individuos de la misma especie.

Vocal learning, that is the song development based upon auditive experience, is a common and widespread phenomenon among songbirds (Kroodsma & Baylis 1982). This learning can be made either through "imitation" or by "improvisation", or both, depending on the species considered (Nottebohm 1970, 1984, Marler 1970). Imitation consists on the copy of an external song model, while improvisation implies a novel song development, unrefered to any external model, but conforming to a species specific pattern.

Inside the family Troglodytidae, comprising 60 american species of wrens (excepting *Troglodytes troglodytes*, which is also found in Europe), imitative vocal learning has been reported only on Long Billed Marsh Wren *(Cistothorus palustris)* (Kroodsma & Pickert 1984 a, b) and on Short Billed Marsh Wren *(C. platensis)* (Kroodsma & Verner 1978). Besides, there is some indirect evidence of its occurrence (song sharing between wild conspecific or mimicry of allospecific songs) on another six species (reviewed in Kroodsma & Baylis 1982) between them on the House Wren *(T. aedon)* (Kroodsma 1973, Murray 1944).

The House Wren is a widespread species found from Canada to Tierra del Fuego; and considering that vocal learning is the main source of vocal variation between populations, it would be possible to found differences between the song repertoire between populations. The aim of this study is to offer some preliminary observations concerning the song of the House Wren in two populations of the eastern Argentina, and some indirect evidences of the existence of vocal imitation in this species based on syllable sharing between subjects living in the same area.

METHODS

From September 1988 to February 1989, songs from adult individuals were recorded, according to the following geographical distribution: 8 individuals in the University of Luján Campus (total = 70 songs, ranging from 3 to 14 songs/individual) and 8 subjects in the Reserve of the Elsa Shaw de Pearson Foundation, Partido de Magdalena (total = 76 songs, 2-20 songs/individual). These two areas are located on the NE of Buenos Aires Province, Argentina, and they are at about 150 km apart. Luján Campus is a typical agro-ecosystem, with a dominant open herbaceous vegetation and several introduced tree species like *Eucalyptus* sp. On the contrary, Magdalena Reserve is a natural open woodland ("talares") composed by a number of tree species: *Celtis tala, Scutia buxifolia, Jodina rhombifolia, Acacia caven,* among others. Although birds were not ringed, however, the chances of recording the same subject twice was negligible mostly due to the high density of these populations. Besides, recordings were performed at least 200 m distance from one another, excepting one case (at University of Luján Campus) where 3 neighbor singing individuals were consecutively recorded.

Recording was done through a UHER 4000 Report-L at a speed of 9.5 cm/s, using a directional hipercardioid LEC 970 LEEA microphone. Sonograms were performed only on best quality recordings, using a Kay Elemetrics Sonagraph 7029-A, set for wide band filters and the 80-8000 Hz frequency range. Several vocalization features, depicted in figure 1, were considered on these sonograms (see Kroodsma 1974):

Note: elementary song particle which is identified in the sonogram as a continuous mark.

Syllable: note or group of notes that form a unity that is stereotypically repeated a certain number of times in the same song, or in a unitary and constant manner between songs.

Trill: cluster of identical syllables.

Phrase: a section of the song, either a syllable or a trill.

RESULTS

Two parts can be generally distinguished within one vocalization: a first part, which includes brief and low amplitude syllables, and a second one that includes syllables of longer duration and higher amplitude (see Figure 1).

Figure 2 shows a catalog of the main syllable types (arbitrarily defined on the bases of their

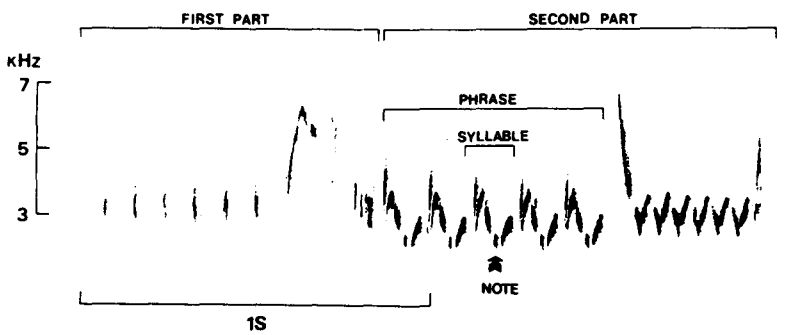

Figure 1: Sonogram of a typical House Wren song from Luján, showing its parts.

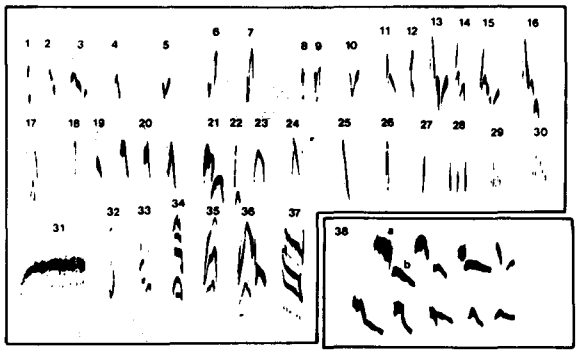

Figure 2: Common syllable types in the songs of House wrens at Luján and Magdalena areas.

spectral structure) found in this study, together with some of the minor variants present inside one of them. Each song part is integrated by several syllable types that are repetitively delivered, thus forming trills; excepting syllable types 25, 26, 27, 31, 32, 33, 37 and 38, which are presented individually.

Almost always the syllabic types used in each of the song parts are different (i.e. syllables 27, 28, 29 and 34 in the first part and syllables 1 to 22, 25, 31 and 38 in the second one). Analising the song in more detail, the position of certain syllables is far from random. Thus, in the sample studied here, syllable 38, if present, is always at the end of the song; while syllable 31 is placed at the start of the second part of the song.

Each subject delivered a repertoire that included 5 to 12 syllabic types, which in turn were arranged into 1 or 2 well defined song types (each song included 6 to 21 syllables). Since the total number of recorded songs per individual was small, these data must be interpreted with precaution; furthermore, Kroodsma (1973) found, using a larger sample (up to 3574 songs/ individual), vocal repertoires of 37 to 90 syllable types. These songs are emitted at 6.17 s intervals (mean, ranging from 4.20 to 9.10 s), conforming series or "bouts". Each song type is stereotypically repeated many times before a change appears (eventual variety). The more frequent modifications introduced into a song type consists on the variation on the number of syllables which form a phrase. To a lesser extent, suppression or addition of a certain kind of syllable in the first part of the song is observed.

In the sample studied here, at least three remarkable examples of syllable resemblances that suggest the existence of intraspecific vocal imitation, were found. Such is the case of syllable type 31 (buzzer), wich is linked to a note that involves a wide range of frequencies. This syllable is virtually identical in two individuals recorded at Luján (L1 and L6), and also resembling one obtained at the same location (L4). The second example is the case of syllable 15 present in subjects L1, L2, and L6 from Luján. Figure 3 illustrate these two cases, excepting subject L2. Finally, figure 4 shows the songs of some House Wrens from Magdalena characterized by the presence of syllable 38 divided into two independent notes (a and b). Such division is not present in Luján population.

Some syllabic types are observed to be shared independently from the area which is considered (e.g., syllables 31, 34 and 38). The lack of characteristic syllables or song patterns for each area suggest the absence of dialects. However, the songs registered in Luján have consistently more syllabic types than those from Magdalena (two-tailed Mann Whitney U test $U= 52{,}5, p<0.05$). This difference is associated with the trend of Magdalena songs to be shorter and composed by fewer syllables than Luján ones. Table 1 shows the observed values (expressed as mean ± standard deviation) of all the above mentioned parameters, together with number of syllables/syllable type and number of syllables/second.

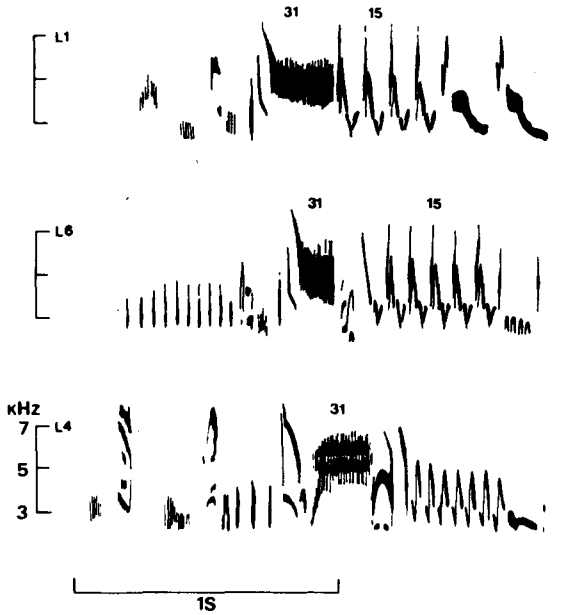

Figure 3: Drawings based on sonograms of representantive songs of three males (L1; L4 and L6) at Luján area. Numbered song portions indicate corresponding syllables.

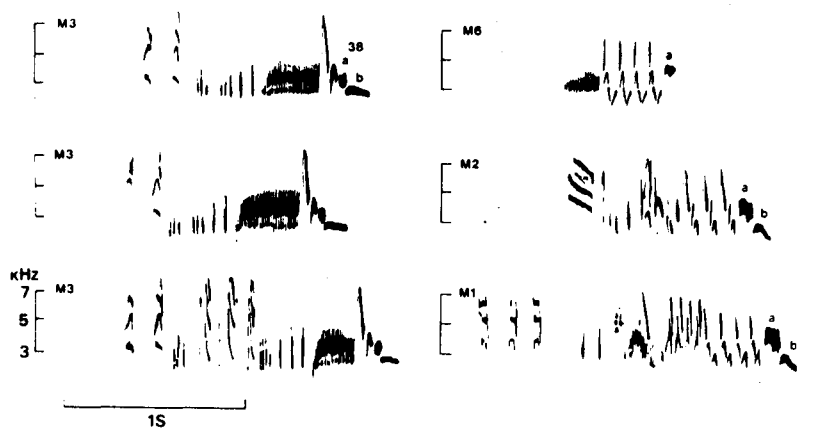

Figure 4: Drawings based on sonograms of representative songs of four Magdalena males (M1; M2; M3 and M6), showing the presence of syllable 38 fractioned in two portions (a and b). The three songs in the left column belong to the same individual (M3) and illustrate the usual range of song variation within a bout.

DISCUSSION

The House Wren's song is highly variable both among individuals and locations. However, there are some constant features that can be recongnized all along the species distribution. Such is the case of their repetitive structure and the presence of the two song parts which are also

found in the songs of the House Wren from Oregon (see sonograms published in Kroodsma 1973), Wisconsin (Platt & Ficken 1987) and Arizona (Lanyon 1960). Moreover, there are some recurrent sylabic types (i.e., 1, 2, 5, 10, 11, 20, 24, 25, 31, 34 and 38 of my catalog) in the song from northern hemisphere indivuduals (see sonograms published in Borror 1964, Kroodsma 1973, Lanyon 1960, Platt & Ficken 1987).

Table 1: Population differences in song measurements

	LUJAN	MAGDALENA
SONG DURATION (s)	1.834 ± 0.159	1.574 ± 0.359
NUMBER OF SYLLABLES/SONG	16.075 ± 2.721	12.684 ± 4.367
NUMBER OF SYLLABLE TYPES/SONG	8.475 ± 1.704*	6.469 ± 1.756
NUMBER OF SYLLABLES/SYLLABLE TYPES	1.931 ± 0.308	1.984 ± 0.465
NUMBER OF SYLLABLES/s	8.759 ± 1.431	8.025 ± 1.721

Sample means ± standard deviation.

* Asterisk between values indicate significant differences ($p<0,05$, two tailed Mann Whitney U test)

Although it is accepted that in species with long repertoires the resemblance of songs from different subjects may be accidental (Baylis 1982), the existence of syllable sharing (at the level of the more subtle details of the acoustic structure and its order of presentation) between individuals living in Magdalena and Luján, suggest that at least in part House Wren song is learned by imitation. There are three other independent studies that reported evidences of vocal imitation in this species. Such is the case of House Wren individuals from Oregon, whose songs resemble those of the sympatric Bewick's Wren, both in syllable types structures and sequence (Kroodsma 1973). The findings from Murray (1944) can also be considered as a good example of mimicry from House Wrens. Finally, Platt & Ficken (1987) found extensive amounts of syllable sharing and, into a lesser extent, identical song types among four House Wren males.

Since syllables are imitated, as is strongly suggested by the evidence above reported, the occurrence of the same types among distant populations is problematic because it implies the existence of an almost perfect mechanism of syllable copying. An alternative explanation for populations syllabic convergencies is that, in certain cases, song elements are improvised according to a species specific motor pattern. In this way, identical syllables could be "discovered" independently in different populations.

Another interesting fact is the ocurrence of differences in the mean number of syllable types per song between Luján and Magdalena samples, because it is accompanied by a tendency of Magdalena's songs to be shorter, with fewer syllables and longer temporal separation than those of Luján. A similar trend regarding the number and temporal separation of the trill notes in the Rufous-collared Sparrow's *(Zonotrichia capensis)* song was also seen between these areas (Tubaro, in prep.). This concordance in the patterns of song variation between species in open fields and open woodland areas, raises the possibility that certain environmental acoustical properties could play a role, at least in part, in the song differentiation between populations, as was suggested, for example, in the Bewick's Wren *(T. bewickii)* (Gish & Morton 1981).

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