VARIATIONS IN SONGS OF VESPER SPARROWS IN OREGON

DONALD E. KROODSMA

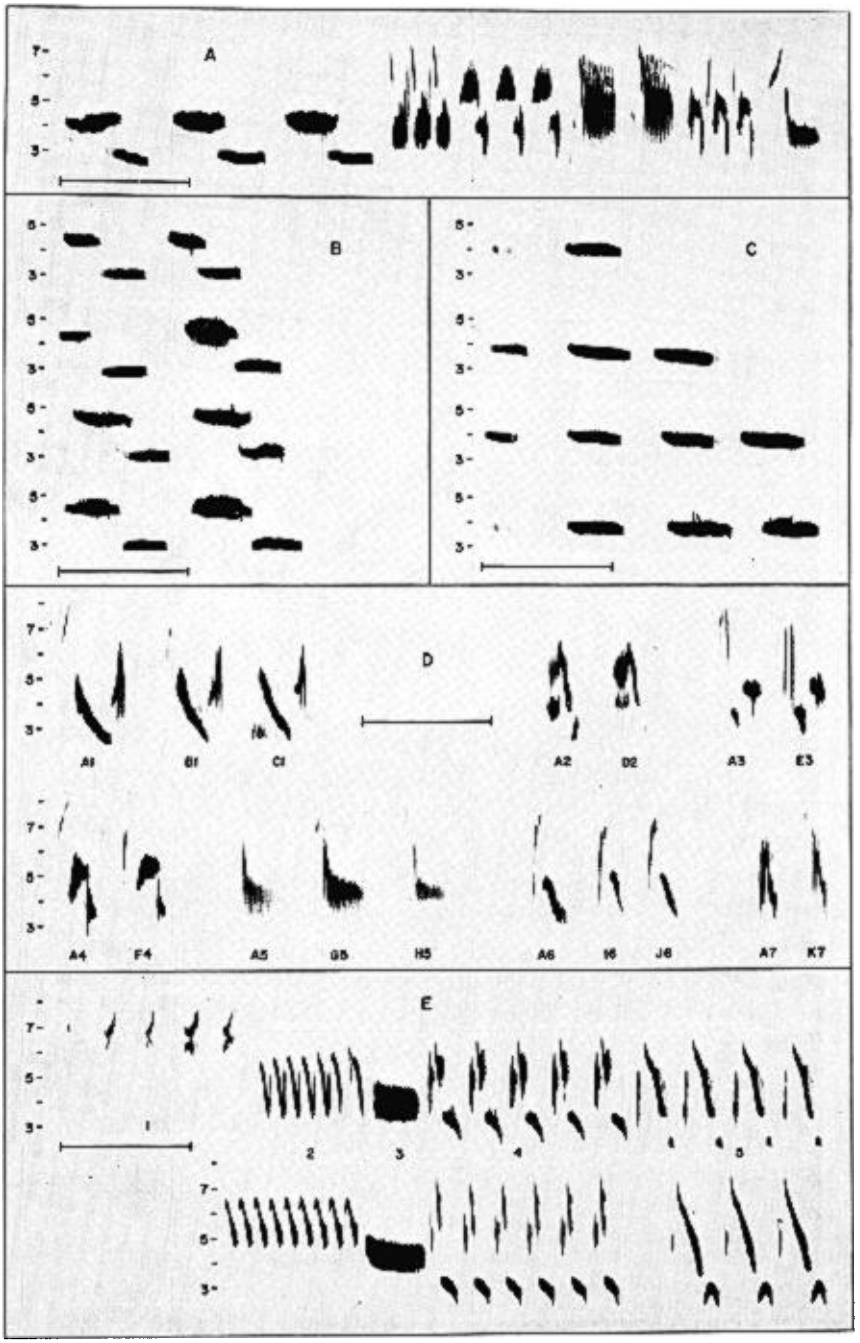
THE Vesper Sparrow (*Pooecetes gramineus*) is an abundant breeding bird throughout much of its range, yet little is known about the behavior of this species. During the summers 1969–1971 I have listened to and recorded many Vesper Sparrow songs in the Willamette Valley of Oregon. Here I describe and discuss: 1) the song in the individual male, 2) noticeable dialect patterns in the songs, and 3) an apparent example of mimicry of a Bewick's Wren (*Thryomanes bewickii*).

I recorded songs at a tape speed of 7.5 ips on a Uher 4000 Report-L tape recorder using a MD405S Cardioid microphone in a 60 cm diameter parabolic reflector. The Kay Sonagraph with the wide (300 Hz) bandpass filter was used to prepare the sonagrams.

DESCRIPTION OF THE SONG

The songs of the Vesper Sparrow in Oregon are similar to those of the eastern subspecies described by Borror (1961). The song is a series of trills, and consists of two–four syllables of relatively long whistled notes followed by as many as seven trills (mean = 4.8, n = 507) of more rapidly repeated syllables (for terminology see Mulligan, 1966). A typical song from the William L. Finley National Wildlife Refuge (Fig. 1A) consists of three introductory syllables followed by five trills. The last trill is frequently abbreviated to a single syllable.

The introductory pattern in the songs of a given bird differ primarily in the number of syllables; when stimulated (e.g., by playback) fewer syllables are used with the more rapid singing rate. The remainder of the song is highly variable; in 400 songs from one individual I found 43 different trill types. Ten of the 43 different trills (often a single syllable) were used relatively infrequently (a total of 48 times) and only on the end of the song. No trill type was used exclusively following the introductory whistles, though two trill types were used here in 363 of the 400 songs (90.8 per cent). I found 218 different trill sequences in the 400 songs; the maximum number of consecutive songs with identical sequences was eight, but 175 of the 218 sequences were used only once. Some commonly used patterns involving two–three trills were apparent within the song, but the highly variable nature of the song is evident. Analyses of recordings from other males did reveal comparable variability.


A
B
C
D
A1
B1
C1
A2
D2
A3
E3
A4
F4
A5
G5
H5
A6
I6
J6
A7
K7
E
1
2
3
4
5

DIALECTS

For the eastern subspecies Borror (1961:170) describes the notes of the introductory pattern as being of "2 types, the first one or two being weaker and lower pitched than the rest." Peterson (1947, 1961, 1963) in his three field guides to the United States uses the same description. These are attempts to characterize the introductory phrases over large geographical areas, but a closer examination reveals apparent dialect patterns. At the Finley Refuge, Vesper Sparrows sing an introductory pattern as shown in Figure 1A and 1B; the syllables consist of two relatively pure frequency notes, the first higher pitched than the second. Only 5 km to the northwest, the introductory patterns are quite different, and consist of two–four notes of the same frequency (Fig. 1C). Approximately 8 km to the northeast from the Finley Refuge I heard still another introductory pattern from several males; it consisted of four notes, the first two of a higher frequency than the last two. This pattern of geographical variation in the introductory phrase is similar to the pattern found in the songs of some passerines where juvenile males learn their adult songs (e.g., Marler, 1967).

Of 60 trill types recorded from other Vesper Sparrows on the Finley Refuge, 10 (16.7 per cent) were identical to those in the repertoire of the single individual discussed above (Fig. 1D). Only one of 16 (6.2 per cent) trill types recorded from the location 5 km distant were identical. The sample size is insufficient as proof, but is suggestive that inter-locality differences may occur, probably as a result of song learning.

One prerequisite for maintenance of local dialects is that birds show a high degree of site tenacity to the locality where songs are learned. Adults do generally return to previous breeding sites (George, 1952), but no data are available for the young.

APPARENT INTERSPECIFIC MIMICRY

Further evidence suggesting that juvenile male Vesper Sparrows might learn their songs lies in the apparent mimicry of a Bewick's Wren song by a Vesper Sparrow (Fig. 1E). Vesper Sparrows are highly variable songsters,

←

FIG. 1. A, a typical Vesper Sparrow song from the Finley Wildlife Refuge. B, introductory patterns from songs of four different individuals at the Finley Refuge. C, introductory patterns from songs of four different individuals 5 km northwest of the Finley Refuge. D, seven syllable types of the well studied male (A) compared with syllable types of other males (B–K) on the Finley Refuge. Syllable types 1, 5, and 6 were found in 2 neighbors of Bird A. E, an atypical Vesper Sparrow song (top) and portions of two Bewick's Wren songs believed to be mimicked (below). The time markers indicate ½ sec, and the vertical scale is marked in kHz.

TABLE 1.
ANALYSIS OF 604 SONGS FROM ATYPICALLY SINGING VESPER SPARROW

Trill Sequence	Number of songs	Per cent
1–2–3–4–5	330	54.6
1–2–3–4–5–6	58	9.6
1–2–3–4–6	69	11.4
1–2–3–4–6–7	147	24.3
	$\Sigma = 604$	$\Sigma = 99.9$

and Armstrong (1963:73) rightly warns that "Very loquacious birds are apt to utter calls fortuitously resembling those of other species just as a silly person who talks incessantly will occasionally say something sensible." However, several facts do suggest the bird was indeed mimicking a Bewick's Wren. The introductory portion is very unlike that of any Vesper Sparrow; the average frequency is higher than that of any other trill encountered in this study, but is very similar to the high frequency notes which often precede the song of a highly stimulated Bewick's Wren. Syllable types 2–4 (Fig. 1E) are almost identical to those found in a single song type of most Bewick's Wrens at the Finley Refuge, and syllable type 5 is like that found in another song type shared by many of the wrens. I found no simple buzzes like syllable type 3 inserted into normal Vesper Sparrow songs. I studied 604 songs from this individual; all began with syllable types 1–4, but one or two other trills (numbers 6 and 7, not illustrated), both typically Vesper Sparrow, were also used (see Table 1). This relative lack of variability in number (only seven) and sequences (only four) of trill types is very atypical for Vesper Sparrows (see above), but the rigid sequence is like that found in the song types of the Bewick's Wren.

Spectrographic analysis revealed the apparent mimicry, but the reactions of three neighboring, territorial male wrens indicated that even the wrens mistook the identity of this bird. The Vesper Sparrow usually sang from several trees in a small clearing which was bordered on two sides by dense riparian vegetation. Early in the spring when the sparrow approached the riverbottom, the wrens responded with the *pit* or *chit* notes used nearly exclusively in territorial encounters (Miller, 1941, and pers. observ.). In addition, the wrens frequently countersang with the song type in their repertoire which resembled the song of the Vesper Sparrow. Later in the season it appeared as if the wrens had habituated to the song, for they responded less aggressively.

Thus, the evidence indicates that Vesper Sparrows may learn part or perhaps all of their songs. Normal song development in many species requires

hearing conspecific males. Wild birds of these species may incorporate into their subsong the calls or songs of other species, but the adult song is usually free of such mimicry. If juvenile males are isolated in captivity and tutored with the songs of other species, they do occasionally learn that species' song. The Chaffinch (*Fringilla coelebs*) and the Western Meadowlark (*Sturnella neglecta*) are two examples (Thorpe, 1961 and Lanyon, 1960, respectively). Non-captive Indian Hill Mynahs (*Gracula religiosa*) learn their call notes from conspecifics, and do not normally mimic other species; captive Mynahs, on the contrary, are renowned for their imitative abilities (Bertram, 1970).

Varying degrees of isolation in the field could also prevent sufficient exposure to songs of conspecifics. A bird raised by an isolated pair and which subsequently wanders through marginal habitats could be insufficiently exposed. Since Vesper Sparrows normally migrate to southern California and if young males are normally receptive in the fall, a bird of a very late summer brood might be exposed to few songs prior to migration. Occasionally a few birds do over-winter in the Willamette Valley. A non-migratory bird would very likely be totally isolated from birds of its own species. In a migratory species it is unlikely that a critical period for song learning occurs during the winter season when most males are silent. However, if young males are usually receptive in the spring, the onset of territorial behavior and perhaps the critical period for song learning in an over-wintering juvenile male could occur prior to the return of conspecifics. As in the laboratory, a secondary preference for the songs of other species might then be expressed. Exposure to wren songs is no difficulty, for wrens are abundant and remain territorial and sing throughout the year.

The very reduced repertoire of this atypically singing Vesper Sparrow perhaps also suggests some isolation from singing conspecifics. One intuitively expects, within limits of course, that if songs are learned or developed through listening to adults, the greater the exposure the more will be learned. Thus, juvenile male Bewick's Wrens learn their songs from adult males during their first summer, and those hatched early in the breeding season develop more syllable types and song types than those hatched later when the singing intensity of adults is reduced (Kroodsma, in prep.).

SUMMARY

The song of the Vesper Sparrow in Oregon consists of a whistled introductory phrase followed by as many as seven different trills. One well-studied individual had a repertoire of 43 different trill types, and sang 218 different trill sequences in 400 songs. The similarities of the trills among neighboring males and the consistent inter-locality differences in the introductory whistled notes suggest that Vesper Sparrows learn at least portions of their songs from adult conspecifics. One male had a reduced song repertoire and sang like a Bewick's Wren; insufficient exposure to songs of adult conspecifics may cause interspecific learning.

ACKNOWLEDGMENTS

Personnel of the William Finley Refuge were most helpful throughout the study. Donald J. Borror offered helpful suggestions for improving the manuscript. Financial aid was provided by an NDEA Title IV predoctoral fellowship.

LITERATURE CITED

ARMSTRONG, E. A. 1963. A study of bird song. Oxford Univ. Press, London.

BERTRAM, B. 1970. The vocal behavior of the Indian Hill Mynah, *Gracula religiosa*. Anim. Behav. Monogr., 3:79–192.

BORROR, D. J. 1961. Songs of finches (Fringillidae) of Eastern North America. Ohio J. Sci., 61:161–174.

GEORGE, J. L. 1952. The birds on a southern Michigan farm. Unpubl. Ph.D. Thesis, University of Michigan, Ann Arbor. (Cited in: Berger, A. J. 1968. Eastern Vesper Sparrow. *In*: O. L. Austin, Jr. (Ed.) Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. U. S. Natl. Mus., Bull. 237:868–882.)

LANYON, W. E. 1960. The ontogeny of vocalizations in birds. p. 321–347. *In*: W. E. Lanyon and W. N. Tavolga (Eds.). Animal sounds and communications. A.I.B.S., Washington, D. C.

MARLER, P. 1967. Acoustical influences in birdsong development. Rockefeller Univ. Review, Sept.–Oct.:8–13.

MILLER, E. V. 1941. Behavior of the Bewick Wren. Condor, 43:81–99.

MULLIGAN, J. A. 1966. Singing behavior and its development in the Song Sparrow, *Melospiza melodia*. Univ. California Publ. Zool., 81:1–76.

PETERSON, R. T. 1947. A field guide to the birds. Houghton Mifflin Co., Boston.

PETERSON, R. T. 1961. A field guide to western birds. Houghton Mifflin Co., Boston.

PETERSON, R. T. 1963. A field guide to the birds of Texas and adjacent states. Houghton Mifflin Co., Boston.

THORPE, W. H. 1961. Bird song: The biology of vocal communication and expression in birds. Cambridge Univ. Press, Cambridge.

DEPARTMENT OF ZOOLOGY, OREGON STATE UNIVERSITY, CORVALLIS, OREGON, 97331, 12 OCTOBER 1971.

PUBLICATION NOTES AND NOTICES

PESTICIDES AND WILDLIFE. [By J. A. Keith and R. W. Fyfe.] Canadian Wildlife Service, Ottawa, 1971: 6½ × 9 in., paper covered, 24 pp., photographs. No price given.

A collection of four articles about research, chiefly in Canada, on the side effects on various wildlife species of the use of agricultural and industrial chemicals. The authors are biologists in the Canadian Wildlife Service. The articles repeat each other to some extent and the story is no longer new; nevertheless the message is well set forth in non-technical language. To quote Fyfe: "If I have been attacking anything, it is all untested and unjustified use, together with the continued defense of widespread applications, of the broad spectrum persistent biocides which are affecting this environment: our environment and that of our children."—P.S.