J. Field Ornithol., 59(1):37-42

RESPONSES OF YELLOW-BREASTED CHATS TO THE SONGS OF NEIGHBORING AND NON-NEIGHBORING CONSPECIFICS

GARY RITCHISON
Department of Biological Sciences
Eastern Kentucky University
Richmond, Kentucky 40475 USA

Abstract.—Yellow-breasted Chats (*Icteria virens*) responded similarly to the songs of neighboring and non-neighboring conspecifics during playback within territories. At territory boundaries, however, chats exhibited significantly stronger responses to the songs of non-neighbors. Thus, chats are able to discriminate between the songs of neighbors and non-neighbors.

RESPUESTA DE *ICTERIA VIRENS* AL CANTO DE CONESPECÍFICOS VECINALES Y NO-VECINALES

Resumen.—Especímenes de *Icteria virens,* respondieron de forma similar a cantos grabados en cintas magnetofónicas de conespecíficos vecinos y no-vecinos dentro de sus territorios. Sin embargo, en los bordes (límites) de sus territorios, estas aves exhibieron respuestas significativamente marcadas cuando los cantos eran de individuos no-vecinos. Estas aves son capaces de discriminar entre los cantos de aves vecinales y no-vecinales.

The ability of territorial males to discriminate between the songs of neighbors and non-neighbors (or "strangers") has been demonstrated in a variety of species, e.g., White-throated Sparrow (*Zonotrichia albicollis,* Brooks and Falls 1975, Falls 1969, Lemon and Harris 1974), Indigo Bunting (*Passerina cyanea,* Emlen 1971), Field Sparrow (*Spizella pusilla,* Goldman 1973), and Common Yellowthroat (*Geothlypis trichas,* Wunderle 1978). All of these species exhibit individual variation in their songs and have relatively small song or note repertoires. The results of studies involving species with larger repertoires suggest an inverse relationship between the degree of neighbor-stranger discrimination and repertoire size. Thus, weak discrimination has been reported in species with larger repertoires, e.g., Song Sparrow (*Zonotrichia melodia,* Harris and Lemon 1976), Chaffinch (*Fringilla coelebs,* Pickstock and Krebs 1980), and Eastern Meadowlark (*Sturnella magna,* Falls and d'Agincourt 1981). Some species of birds have very large repertoires. One such species appears to be the Yellow-breasted Chat (*Icteria virens*). Although some disagreement exists concerning the mimicking abilities of chats (Kroodsma 1982), previous reports seem to indicate that the vocal repertoires of individual chats are very large. Bent (1953:587) referred to the songs of chats as "a medley of strange sounds, musical and otherwise." Saunders noted that "the phrases vary greatly in quality, consisting of whistles, harsh cackles, squawks, squeals, and various explosive noises, not always easy to describe" (Bent 1953:592). Based on the results of previous studies of species with large vocal repertoires, it would seem that such variability could interfere with the ability of chats to discriminate between the songs of

neighbors and non-neighbors. The objective of this study was to determine if such discrimination occurs in the Yellow-breasted Chat.

METHODS

Fieldwork was conducted from 5 May to 15 Aug. 1983 at the Central Kentucky Wildlife Management Area, located 17 km SSE of Richmond, Madison Co., Kentucky. Playback experiments were conducted with nine color-banded male chats during the period from 18 May to 10 Jun. 1983.

Birds with common territorial boundaries were referred to as neighbors and those from areas at least 1 km distant were designated non-neighbors. Although birds were exposed to the songs of neighboring males daily, it was assumed they had little or no previous contact with the songs of non-neighbors. Recordings were made using a Uher 4000 Report Monitor tape recorder and Dan Gibson parabolic microphone. Experimental tapes were prepared from these recordings. The songs of chats are rather atypical, consisting of a variety of sounds uttered at irregular intervals (Fig. 1). Thus, playback tapes were simply randomly selected 3-min segments of such sounds. For playback a portable speaker-amplifier was connected to the Uher with a 35 m cord and placed in a bush or small tree 1–2 m above ground.

Each playback experiment consisted of three 3-min segments. During the first 3-min (pre-test period), undisturbed, ongoing behavior was observed. During the second 3-min (test period), songs were played back. The final 3-min (post-test period) was used again for observation. Each bird was tested four times: (1) neighbor's songs in the territory, (2) neighbor's songs at the territory boundary, (3) non-neighbor's songs in the territory, and (4) non-neighbor's songs at the territory boundary. Tests with individuals were at least 2 d apart. The sequence of test songs played to each bird was random. All experiments were conducted between 0600 and 1100 EDT. At the boundaries the speaker was directed toward the center of the territory to minimize the neighbor's responses. In the territory, speaker orientation was not standardized. Boundaries were established for each territory by observations of movements and encounters.

To obtain a quantitative measure of a bird's reaction to playback the following features of response were used: (1) Closest approach. The distance of the experimental bird's closest approach to the speaker was noted. (2) Time spent within 3 m of the speaker. (3) Number of flights. This included short flights but not short hops from branch to branch in a tree or bush. (4) Number of "meow" calls. Such calls were uttered by chats in situations that appeared to indicate anxiety or mild distress. (5) Number of syllables and trills. As noted above, the songs of chats are not like those of most passerines. Therefore, it was not possible to determine the number of songs uttered by an experimental bird. Thus, during each test period the total number of individual syllables and the total number of trills uttered by an experimental bird were noted. A syllable was defined as a short, well-defined sound, separate in time from other such sounds

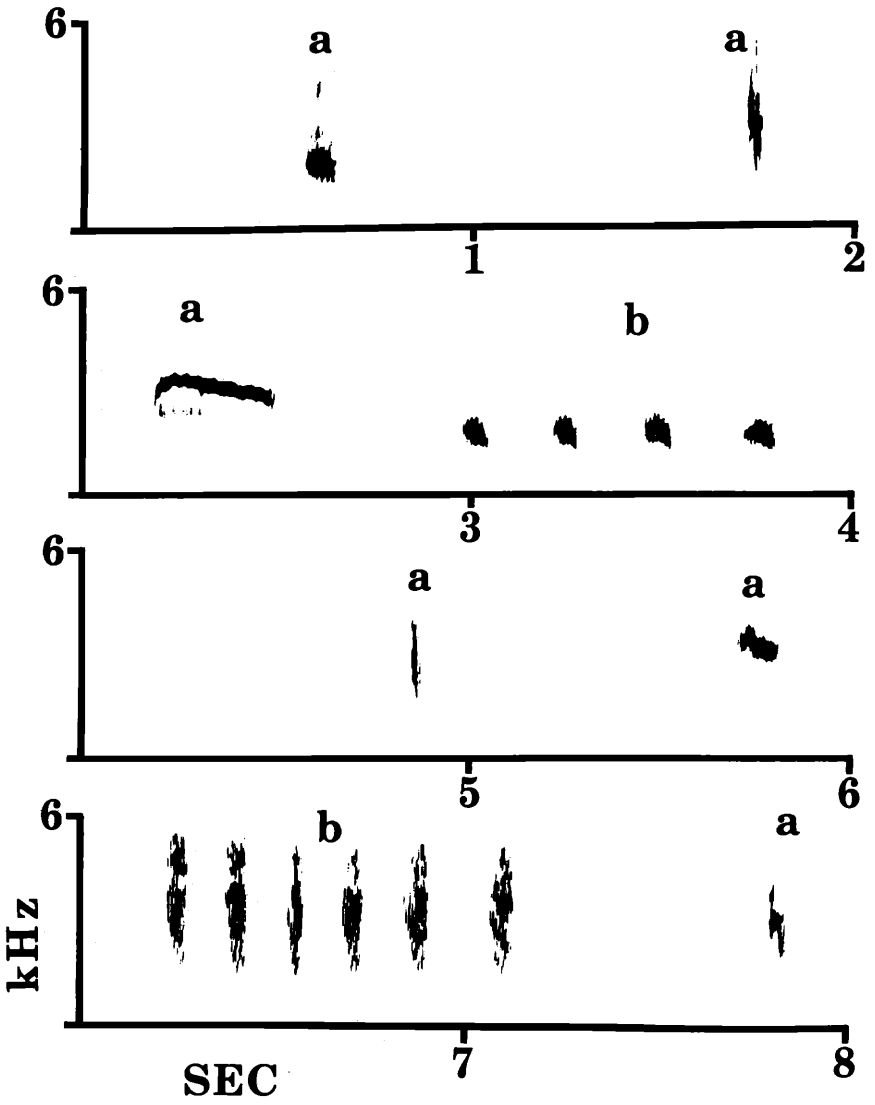

FIGURE 1. A portion of a Yellow-breasted Chat song showing syllables (a) and trills (b).

(Fig. 1). A trill was defined as a rapid series of similar sounds (Fig. 1). (6) Latency to the first song. The time from the start of the test tape to the time when the experimental bird first uttered a sound was noted. The Wilcoxon signed-ranks test was used for all statistical comparisons (Sokal and Rohlf 1969).

TABLE 1. Responses of Yellow-breasted Chats to recorded songs of conspecific neighbors (N) and non-neighbors (N-N) at the territory boundary (numbers represent means for nine birds).

Response measure	N	N-N	Stronger response to:
Closest approach (m)	39.8	8.3	N-N*
Flights (play)	3.5	8.5	N-N*
Flights (post)	3.2	5.2	N-N
Syllables (play)	3.7	0.2	N
Syllables (post)	4.3	6.7	N-N
Trills (play)	0.8	0.2	N
Trills (post)	2.0	2.5	N-N
"Meow" calls (play)	0	17.8	N-N*
"Meow" calls (post)	9.3	10.0	N-N
Latency to first song (min:s)	0:42	0:53	N
Time w/in 3 m (play)	0:20	2:28	N-N*
Time w/in 3 m (post)	0:00	0:14	N-N

* $P < 0.025$ (Wilcoxon test, one-tailed).

RESULTS

Yellow-breasted Chats exhibited a significantly stronger response to playback of the songs of non-neighboring males than to playback of the songs of neighboring males at the territorial boundary (Table 1). Whereas males typically responded to the songs of non-neighboring chats by approaching the speaker, calling ("meow" calls), and making several short flights, playing back the songs of neighboring males at the territorial boundary elicited no significant responses. On the other hand, Yellow-breasted Chats responded similarly to the songs of neighbors and non-neighbors when played back in the territory (Table 2) by closely approaching, flying around the speaker, and calling.

DISCUSSION

Yellow-breasted Chats clearly were able to discriminate between the songs of neighbors and non-neighbors, responding more strongly to the songs of non-neighbors at territory boundaries. Similar discrimination has been reported in a wide variety of species. Such responses appear to be adaptive, i.e., the recognition of neighbors permits birds to conserve time and energy and reduce their exposure to the risks of injury and predation that accompany fighting (Falls 1982).

Song repertoires may serve a variety of functions and confer various benefits (Krebs and Kroodsma 1980). As noted by Falls and d'Agincourt (1981), such benefits must be weighed against possible costs, one of which may be a reduction in neighbor-non-neighbor discrimination. Larger repertoires mean that there are more sounds to be learned and, therefore, discrimination may be more difficult. Such a reduction in the ability to discriminate between the songs of neighbors and non-neighbors has been reported in species with larger repertoires, e.g., the Eastern Meadowlark

TABLE 2. Responses of Yellow-breasted Chats to recorded songs of conspecific neighbors (N) and non-neighbors (N-N) in the territory (numbers represent means for nine birds).

Response measure	N	N-N	Stronger response to[1]:
Closest approach (m)	0.7	9.1	N
Flights (play)	14.5	11.2	N
Flights (post)	3.8	3.2	N
Syllables (play)	4.0	4.8	N-N
Syllables (post)	11.0	16.3	N-N
Trills (play)	2.5	6.3	N-N
Trills (post)	5.8	11.0	N-N
"Meow" calls (play)	14.3	11.7	N
"Meow" calls (post)	36.3	4.0	N
Latency to first song (min:s)	1:32	0:48	N-N
Time w/in 3 m (play)	2:15	1:31	N
Time w/in 3 m (post)	1:48	1:09	N

[1] None of these differences is significant.

(Falls and d'Agincourt 1981). Although there has been no detailed analysis of the repertoire sizes of individual Yellow-breasted Chats, previous authors have noted that chats seem to use a wide variety of different sounds (Bent 1953, Cook 1935, Townsend 1924). Such variability (i.e., large repertoires) should result in a reduction in the ability of chats to discriminate between the songs of neighbors and non-neighbors. This, however, does not appear to be the case, chats clearly exhibited such discrimination.

These results may be explained in at least two ways. First, chat vocalizations have not been analyzed quantitatively and, therefore, it is possible that the vocal repertoires of chats are not as large as has been suggested. Second, Falls (1982) has suggested that birds with large repertoires may frequently repeat individually distinctive sounds. Such repetition would clearly make discrimination easier. Saunders suggested that chats tend to repeat sounds, noting that individuals had six to 10 "commonly used" phrases (Bent 1953). Further study is needed to determine the size of the vocal repertoire of individual Yellow-breasted Chats and to determine if the repetition of "phrases" plays a role in neighbor-non-neighbor discrimination.

ACKNOWLEDGMENTS

I would like to thank T. Ritchison for assistance in the field and J. M. Wunderle, E. H. Burtt Jr., and an anonymous reviewer for comments on the manuscript.

LITERATURE CITED

BENT, A. C. 1953. Life histories of North American wood warblers. U.S. Nat. Mus. Bull. No. 203.

BROOKS, R. J., AND J. B. FALLS. 1975. Individual recognition by song in White-throated Sparrows. I. Discrimination of songs of neighbors and strangers. Can. J. Zool. 53:879–888.

COOK, H. P. 1935. The song of the Yellow-breasted Chat. Wilson Bull. 42:297–298.

EMLEN, S. T. 1971. The role of song in individual recognition in the Indigo Bunting. Z. Tierpsychol. 28:241–246.

FALLS, J. B. 1969. Functions of territorial song in the White-throated Sparrow. Pp. 207–232, *in* R. A. Hinde, ed. Bird vocalizations. Cambridge Univ. Press, New York.

——— 1982. Individual recognition by sounds in birds. Pp. 237–278, *in* D. E. Kroodsma and E. H. Miller, eds. Acoustic communication in birds, vol. 2. Academic Press, New York.

———, AND L. G. D'AGINCOURT. 1981. A comparison of neighbor-stranger discrimination in Eastern and Western meadowlarks. Can. J. Zool. 59:2380–2385.

GOLDMAN, P. 1973. Song recognition by Field Sparrows. Auk 90:106–113.

HARRIS, M. A., AND R. E. LEMON. 1976. Responses of male Song Sparrows to neighbouring and non-neighbouring individuals. Ibis 118:421–424.

KREBS, J. R., AND D. E. KROODSMA. 1980. Repertoires and geographical variation in bird song. Pp. 143–177, *in* J. S. Rosenblatt, R. A. Hinde, C. Beer, and M.-C. Busnell, eds. Advances in the study of behavior. Academic Press, New York.

KROODSMA, D. E. 1982. Learning and the ontogeny of sound signals in birds. Pp. 1–23, *in* D. E. Kroodsma and E. H. Miller, eds. Acoustic communication in birds, vol. 2. Academic Press, New York.

LEMON, R. E., AND M. HARRIS. 1974. The question of dialects in the songs of the White-throated Sparrow. Can. J. Zool. 52:83–98.

PICKSTOCK, J. C., AND J. R. KREBS. 1980. Neighbour-stranger discrimination in the Chaffinch. J. Ornithol. 121:105–108.

SOKAL, R. R., AND F. J. ROHLF. 1969. Biometry. W. H. Freeman and Co., San Francisco.

TOWNSEND, C. W. 1924. Mimicry of voice in birds. Auk 41:541–552.

WUNDERLE, J. M., JR. 1978. Differential response of territorial Yellowthroats to the songs of neighbors and non-neighbors. Auk 95:389–395.

Received 8 Dec. 1986; accepted 22 Jul. 1987.