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**Interspecific learning and cultural transmission of song in House Finches.**—House Finches (*Carpodacus mexicanus*) recently have extended their range in eastern North America and changed their songs by a process of cultural evolution, with song neighborhoods developing along the east coast apparently from a single ancestral population between 1939 and the late 1960's (Mundinger 1975, 1980). Here we report a rapid cultural change in songs of wild House Finches and an instance of reciprocal learning of song elements between species, the House Finch and the Common Canary (*Serinus canaria*).

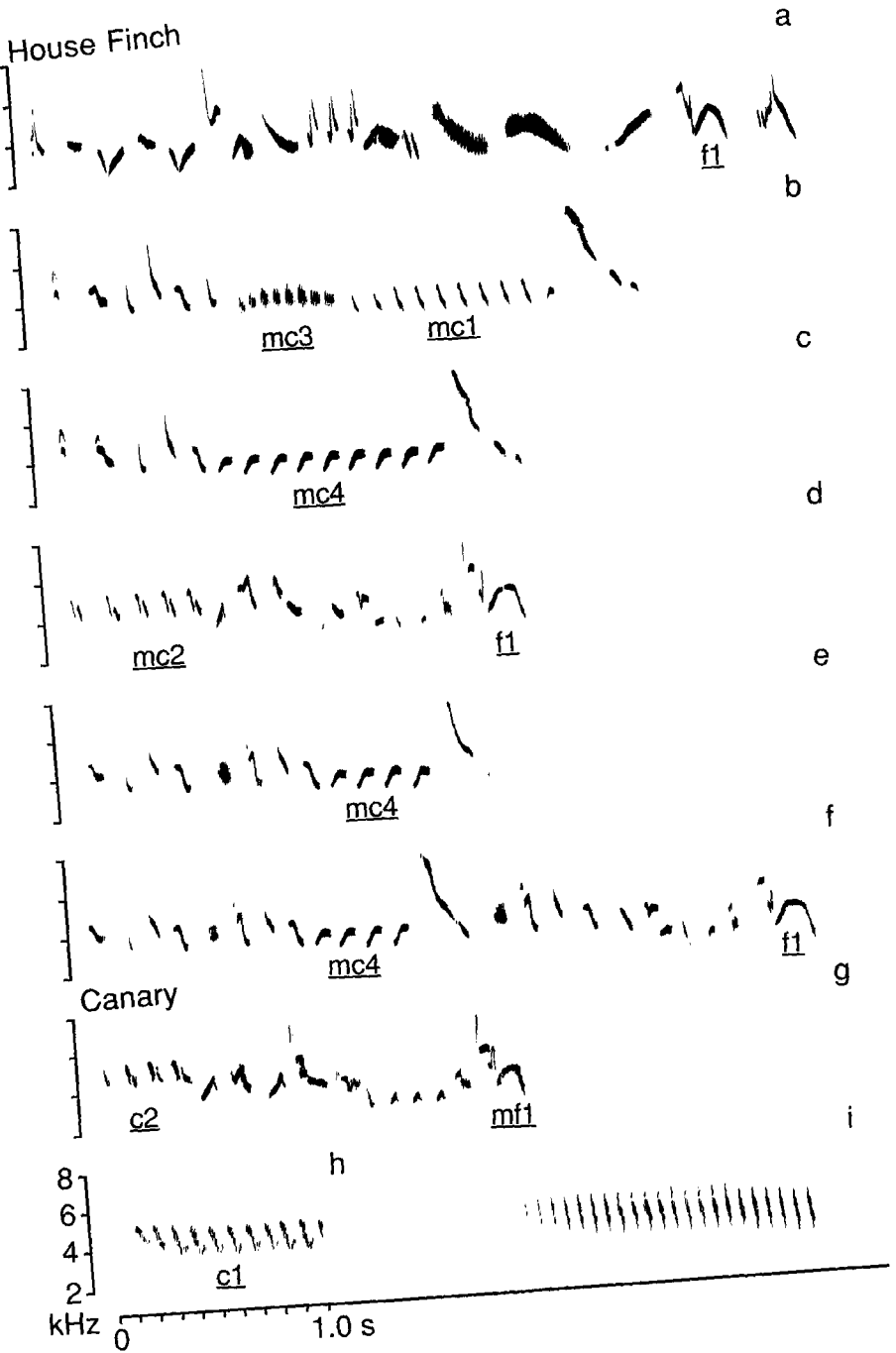
On 21 and 24 May 1987, an unbanded House Finch was observed for 1 h in a residential area of Ann Arbor, Washtenaw County, Michigan (42°18'N, 83°43'W) and its songs were recorded on a Sony TCM-5000 cassette tape recorder with a Sennheiser ME-40 microphone in a 330-mm parabolic reflector. It was brightly colored with red underparts; the flanks were streaked but not the breast or most of the belly. The male repeatedly sang while perched and during slow flight displays away from his mate, which remained on a nest high in a spruce. This flight display is typically seen during courtship (Thompson 1960). The male fed the female near the nest. The same male apparently had nested earlier; he fed two grown fledglings perched 10–20 m from the nest, and the female joined them from the nest.

Songs were audiospectrographed at 300-Hz band on a Kay Elemetrics Co. "Vibralyzer." The male had two recognizable song types or themes, and both were "mixed" with elements of two species, phrases ("tours") of canaries in the middle of the song and phrases typical of local House Finches at the beginning and ending of the songs (Fig. 1). The two song themes were given in irregular alternation and in approximately equal numbers. The canary tours were recognizable by rapid trilling of simple notes, in contrast to usual House Finch songs which do not repeat notes in series and which have longer, more complex notes (Mundinger 1975, Bitterbaum and Baptista 1979).

On 31 May 1987, RBP found more House Finches with canary tours, two neighboring males on the campus of the University of Michigan, 2.9 km from the area where the first male sang. Each had two similar recorded song themes; one theme had a canary tour introduction and the other had a tour in the middle. One theme is illustrated in Fig. 1; the other ("d") also was shared by the two House Finches, indicating a matching of song repertoires. One male was brightly plumaged, reddish, with heavy streaking below and had a metal band on one leg; the other was dull with a patch of pink on one side of the breast and was unbanded. Each male repeatedly accompanied its nest-building female to her nest. Other finches on campus had normal House Finch songs (theme "a" and other themes).

House Finches were first seen in Ann Arbor in 1981 and nested in 1982 (Payne 1983). In 1987, they were the most numerous songbird on campus and at least 200 pairs lived in Ann Arbor. Songs of six males were recorded in early spring during 1985, and 12 others were recorded in February and March 1987; none had canary elements.

Both the campus and residential House Finches may owe their canary tours to the same canary. In 1983, SW observed a banded canary feeding with several House Finches at an outdoor feeder on campus from late April through the summer. During summer, she captured it and released it on campus; she recaptured it again in early October. She moved it from the campus into a home, where it lived next to a window where wild House Finches visited a window feeder. The finches and canary often sang back and forth. The canary site is only 150 m from the nest of the residential canary-tour House Finch and 100 m from one of the finch's singing perches. The finch several times was seen flying toward the canary site from this perch. The tours in the mixed songs of House Finches on campus and in the residential area had notes like the suspect song-model canary, perhaps significant because canaries have many kinds of notes in their songs (Güttinger 1985). The canary's songs were recorded later



in 1987; it is uncertain whether its repertoire was completely sampled. Not only did the wild House Finches learn song elements from the canary, but the canary sang parts of the song of the House Finches as well as characteristic canary songs and had apparently learned these themes from the House Finches (Fig. 1; compare audiospectrograms of normal canary song in Güttinger 1985). The canary had the House Finch themes in its repertoire for at least a year.

The canary tours were apparently transmitted from one House Finch to another as well as between canary and House Finch, because the neighboring birds on campus had nearly identical mixed song themes. House Finches have occasionally learned the songs of other species in the field (Baptista 1972), and canaries and other cardueline finches sometimes imitate the notes and song organization of other species (Güttinger 1974, Remsen et al. 1982). The more brightly colored, banded House Finch on campus had some longer canary tours than any heard from the duller male. The plumage difference suggests that the younger copied the themes of the older; male House Finches in their first year tend to be less reddish than older males, though plumage colors of the age classes may overlap (Michener and Michener 1931).

Mundinger (1975, 1980) interpreted the microgeographic variation in song among House Finches on the east coast as a result of errors or "cultural mutations" in learning the songs of older individuals and with their subsequent dispersal and being copied themselves when they are the only song models in the neighborhood for younger finches. By this reasoning, we predict that the mixed-species song themes of the House Finches in Ann Arbor will degrade rapidly, because most neighboring finches have more species-typical songs. On the other hand, if House Finches learn from single song tutors, we predict a persistence of the mixed song themes in Ann Arbor.

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FIG. 1. Songs of House Finches and canaries in Ann Arbor, Michigan. a–f, House Finch; a, campus, 14 April 1985; b, c, two song themes of residential House Finch on 21 May 1987, with three canary tours; d, e, two song themes of a banded House Finch on 31 May 1987; f, one song type of an unbanded House Finch on 31 May 1987 (note resemblance of song themes e and f and perhaps also c, indicating song transmission between House Finches); g, song of a captive canary that had lived with wild House Finches; h, i, normal tours of the same canary, edited from longer themes. For evidence that House Finches copy canary song elements, compare *mc1* and *c1* (b and i), *mc2* and *c2* (d and g), and *mc1* and *mc4* with canary tours in Fig. 1 of Güttinger (1985); *mc3* is tentatively identified as a canary note because it is given in a tour like the other canary notes. For the canary copying House Finch song, compare the nonrepeated elements of g with song of a normal House Finch (a) and with Thompson (1960), Mundinger (1975), and Bitterbaum and Baptista (1979); and the terminal song element *mf1* (g) with *fl* (a, d, and f) and with syllable 94 in Bitterbaum and Baptista (1979).

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**Sequential polyandry by a female Killdeer.**—The Killdeer (*Charadrius vociferus*) is considered to be monogamous (Bunni 1959, Lenington 1980), with males taking a greater role in parental care than females (Mundahl 1982; Brunton 1987, 1988a, b). Female desertion of mate and nesting attempt has been observed in some populations, especially late in the breeding season or after a second clutch (Bunni 1959, Lenington 1980), but apparently is rare or absent in others (Brunton 1987). Reproductive success of deserted males generally is lower than that of pairs, but few data exist for comparisons (Lenington 1980, Brunton 1988a). Also, the subsequent behavior of deserting females rarely has been observed because of the difficulties of following these birds over a large area. Here I report the first documented case of a sequentially polyandrous female Killdeer.

I studied Killdeer in the Houghton Lake region of Michigan from April through August 1984 and 1985. Nesting attempts of 41 pairs of Killdeer were monitored, and 37 males and 27 females were captured and color banded. During the study, 66% (27/41) of all nesting pairs remained monogamous and stayed on the same territory throughout the breeding season. Pairs that failed in consecutive nesting attempts in a single year were more likely to change territories than those having a successful nesting ( $\chi^2 = 16.2$ ,  $P < 0.001$ ). During 1985, a pair color banded in 1984 was first observed on their territory on 11 April and their nest containing two eggs was discovered on 21 April. Incubation began on 25 April, and chicks hatched on 17 May. The female was last observed foraging in the territory on 20 May. The male (M1) continued to care for the chicks and successfully raised one chick to fledging. M1 remained on the territory but did not remate in 1985. On 18 May 1985, the female was observed copulating with an unmated male (M2) on a territory approximately 0.5 km away from where M1 was still caring for their offspring. M2 was banded during 1984 on the same territory. He returned alone and remained unpaired during 1985 up until the appearance of the female. On 22 May a nest containing three eggs was discovered. Both