AN INTERGENERIC HYBRID FLYCATCHER (*TYRANNUS* × *MUSCIVORA*)

L. IRBY DAVIS AND FRED S. WEBSTER, JR.

2502 Keating Lane
Austin, Texas 78703

4926 Strass Drive
Austin, Texas 78731

Hybridization of *Tyrannus verticalis* and *Muscivora forficata* has not been recorded (Gray 1958); therefore, the appearance at Austin, Texas, of an individual exhibiting some of the morphological features and vocalizations of each species seems worthy of documentation. This apparent hybrid was observed by Webster over a period of weeks as it participated in a nesting attempt with a female kingbird (*T. verticalis*). Vocalizations were recorded by Davis and the bird was photographed by Mary Anne McClendon and Marie Webster. As a matter of convenience, it will be referred to herein as "the hybrid."

ARRIVAL AND ESTABLISHMENT OF TERRITORY

On 18 April 1967 a bird, which at first appeared to be an unusually short-tailed *M. forficata*, was observed in the vicinity of the U. S. Post Office on the eastern edge of downtown Austin. It remained in this area through 22 June and was observed almost daily. Meanwhile, on 26 April, two kingbirds (*T. verticalis*) were seen in a small grove of post oak (*Quercus stellata*) and live oak (*Q. virginiana*) on the corner opposite the post office, the site of a successful nesting by this species a year earlier. The kingbirds also remained in the area, and on 3 May three kingbirds and the hybrid were seen perched together on a wire. On 4 May these birds seemed to be engaged in courtship activity among the oaks. On 5 May four kingbirds were present, one of which remained closely associated with the hybrid, and territorial behavior on the part of the hybrid was first noted. The hybrid was known to range over an area roughly comprising nine city blocks (each approximately 91.5 m × 91.5 m), but often could not be located within that square; in any event, the clump of oaks was invariably the focal point of its activities.

NESTING ACTIVITY

By 9 May it was apparent that one kingbird had joined the hybrid in defense of the oak clump against intrusions of other kingbirds as well as other bird species. Usually the hybrid was the more active and vocal of the pair and more aggressive in territorial defense. Subsequent behavior tended to confirm that the hybrid was the male of the pair.

On 26 May the kingbird visited clumps of foliage in a post oak which extends over the curb, as though searching for a place to deposit a bit of unidentified material carried in its bill. On 27 May a string dangling from a branch in this tree indicated the start of a nest, and more string looped around or hanging loosely from the branch was evident at daybreak the following morning. From their roost perches in this tree, the pair moved toward the nest site at dawn on 28 May. The hybrid visited the site three times before the kingbird, which had followed closely all the while, started working with the material. Interruptions occurred as both birds drove from their territory another kingbird, a jay (*Cyanocitta cristata*), and a grackle (*Quiscalus mexicanus*) which visited the nest tree. By noon the pair seemed less interested in the nest than in flycatching and patrolling the area.

On the morning of 30 May the kingbird was busy at the nest site and had partially completed a grass base for the saucer. It was located in the fork of a small branch about 8.6 m above street level and about 5.5 m out from the center of the tree (as projected from the base), which placed its position just beyond the curb and over the street. On 12 June the nest appeared to have been completed; the kingbird moved about on the nest occasionally, but more often was seen perched nearby. By 15 June the kingbird was found on the nest frequently, and it was assumed that incubation was in progress. To this date the hybrid had remained conspicuously present and, in respect to the kingbird and the nest, continued to behave in the manner of a territorial male.

The hybrid was last seen on 22 June. On that morning it sang its dawn song from the nest tree before sunrise, and was seen as late as 07:00 (CDT). No further observations were made until the morning of 26 June; in the interim it had disappeared.

During the nest-building and presumed incubation period of the kingbird-hybrid pair,

The Condor, 72:37–42, 1970

three pairs of kingbirds (*T. verticalis*) were nesting within 168 m of the former's nest. No attempt was made to delineate territorial boundaries, which, in any event, were not rigidly or consistently defended. Following the disappearance of the hybrid, the interactions of conspecific individuals became more confusing, and during the next few days as many as four kingbirds could be seen at the same time in the oak clump. Also, it was during this period that one of the three kingbird nests was abandoned, with the disappearance of the incubating female.

A kingbird, presumably the hybrid's mate, was observed on the nest in the oak clump on 26 and 27 June; however, another kingbird was keeping close company with her, and on 28 June copulation was observed. Now the female's interest in the nest declined rapidly, although she was seen on the nest as late as 30 June. By 3 July the kingbirds had deserted the oaks, and on this date a female grackle (*Q. mexicanus*) picked at the nest, almost dislodging it.

DESCRIPTION

The following description is based on observations in the field, and study of 35-mm color transparencies. The hybrid was not examined in the hand.

In conformation and plumage color, the bird most closely resembled *M. forficata*. The contour feathers were dull white (whiter on the throat) to pale gray (on the back), except for those of the lower breast, belly, and flanks, which were light yellow (considerably paler than in *T. verticalis*). The lores were black, and there was the suggestion of a line behind the eye. No crown patch was seen. The wings were dark, except for white edges distally on the secondaries and the greater secondary coverts.

The color pattern of the tail depended on the arrangement of the rectrices at the time of observation. With the rectrices tightly closed, the tail was wholly dark above except for narrow, contrastingly light terminal margins. At times, the white edging of the outer feathers was visible, as is typical of *M. forficata*. The under side of the tail displayed white proximally for more than one-half or two-thirds its length; the distal portion was dark brown.

Tail and wing length were approximately equal, as measured from photographs; thus, the tail of the hybrid was about 13–26 mm shorter than those of first-year male *M. forficata* skins examined, but, based on these same measurements, perhaps 26 mm longer than *T. verticalis*. Individual rectrices varied to less than half the overall tail length.

Three distinct graduations were apparent in the rectrices, although these did not seem bilaterally symmetrical; however, we found that lack of symmetry is not an uncommon character in skins of *M. forficata*. Rectrices 1, 2, and 3 of the hybrid were unusually long compared with those of a first-year male or a female *M. forficata*. Graduation between the first three pairs of rectrices was predictably slight, but the distance between the tip of the third feather and the tip of the fourth was abnormally short, as compared with *M. forficata*, and to a lesser degree this was true of the further extension of the fifth feather.

When the hybrid was perched, with rectrices tightly closed, the tail tip was distinctly notched, at least as deeply as that of *T. melancholicus*, but occasionally a deep scissors-like separation was observed. When the bird preened, with rectrices spread, the scissors were evident, as was the irregular alignment of the inner rectrices. Oddly enough, when the tail was fanned in flight, the tip presented a wide, smoothly concave edge, in contrast to the convex arrangement of *T. verticalis*, but quite unlike the deep fork characteristic of even short-tailed *M. forficata*. This feature, in the case of the hybrid, would seem to be attributable to the more even graduation of the rectrices.

VOCALIZATIONS

In order to discuss the voice of the hybrid, we will compare the phrase of the dawn song of this bird with those of *M. forficata* and *T. verticalis*. The spectrograms of figure 1 were made from the dawn song phrases of *T. verticalis*, the hybrid, and *M. forficata*, respectively. We have in each case a series of simple "wit" figures, followed by a terminal motif of three or four figures which are more or less specialized. The terminal motif is delivered as a loud, strongly accented outburst. The recordings in figure 1A and B were made near the post office in downtown Austin, and the *M. forficata* recordings (fig. 1C) were made about 3.8 km away in a park meadow.

In the following description a "wi" is used to indicate a steep upward slur; a "t" is used when the decay of the sound is rapid and begins almost as soon as the maximum frequency is reached (hence the "wit"). When the figure is similar but of longer duration and more nearly flattened at the top in a spectrogram, it is called a "chip." In contrast, if the buildup and decay are both somewhat

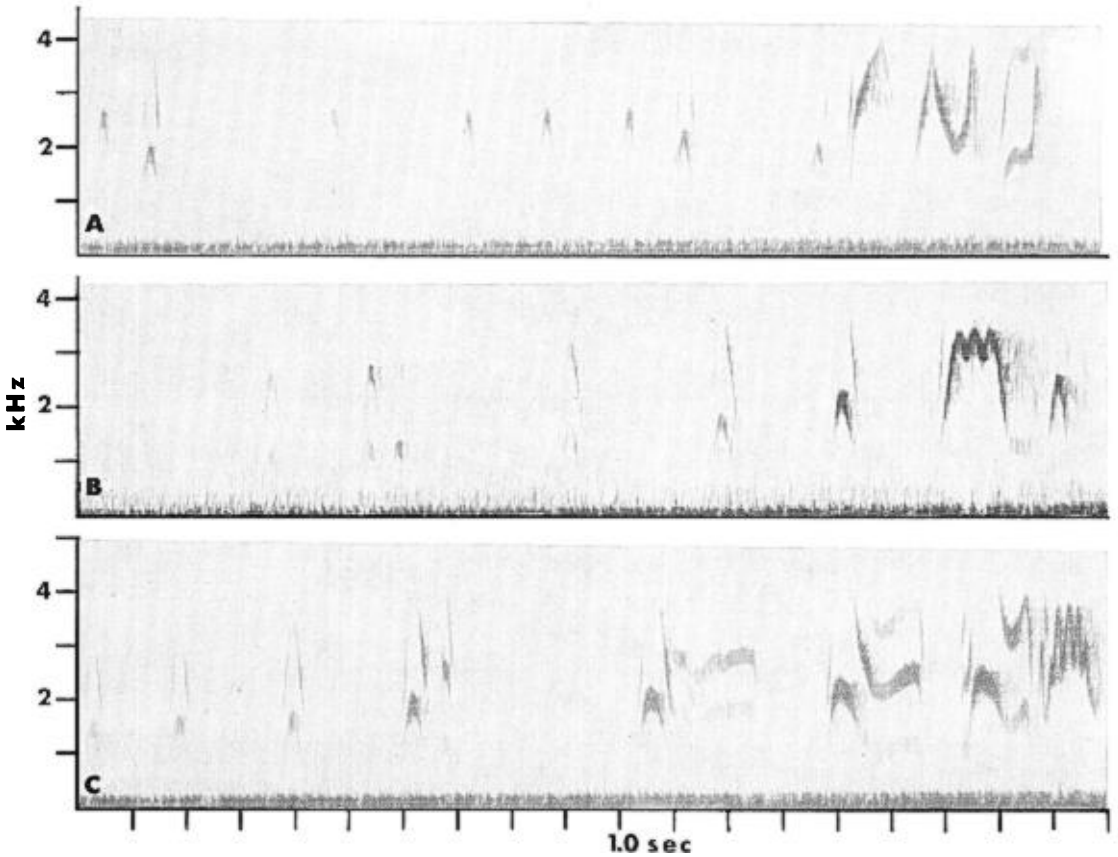

FIGURE 1. Spectrographs of dawn song phrases. A. *Tyrannus verticalis*. B. hybrid *Tyrannus* × *Muscivora*. C. *Muscivora forficata*.

less steep but the decay sets in very quickly after the peak frequency is reached, the term "will" is used.

Figure IA shows three "wits" given by the singer (there are also five weaker "wits" at slightly higher pitch given by another bird, presumably a female, in the same tree) followed by a three-figure terminal motif. The first figure of this motif is a modified and greatly enlarged "wit." The second figure appears as a somewhat irregular "M" made by fusing two "wits." The last figure appears as a greatly modified form of the second figure, with the first segment decidedly flattened and the last segment hurried and cut off quickly.

Figure 1B shows some soft "wits" followed by a terminal motif of three loud, sharply-accented figures. Here the first and last figures are simple "wits," and the middle one is a modified "wit" which is three times as long and hence is a "chip." The sound wave is not pictured as a simple "chip" with smoothly rounded top; instead, the carrier appears to be modulated by another wave with a frequency of about 35 Hz. This frequency modulated figure and others like it will be referred to as a FM figure.

Figure 1C shows a terminal motif of four figures, the first three of which are variants of the same thing and are more or less similar to the M figure in figure 1A (the second segment or last half of the M is greatly flattened, drawn out and less sharply peaked than in the M figures of *T. verticalis*). The final figure is a still more decidedly modified M. The first segment (one cycle) of the M figure is weak and quite short; the last is much longer and appears as a frequency modulated "chip" as in the FM figure in the previous spectrogram. But here the carrier wave of the "chip" is evenly modulated throughout, giving a warble frequency of about 50 Hz.

Other phrases voiced by the individual kingbird that produced the one pictured in figure 1A were very similar. The only appreciable variation was the rather frequent use of a fourth figure in the terminal motif. In these cases the extra figure was always a repetition of the last figure pictured in 1A.

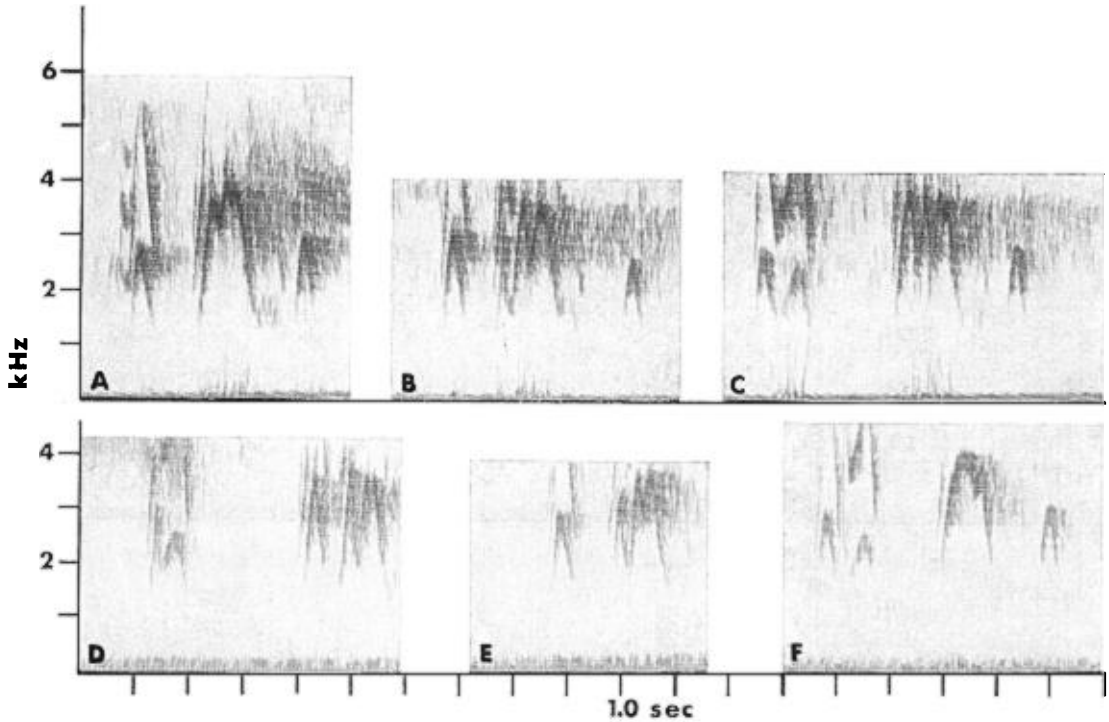

FIGURE 2. Spectrographs of terminal motifs from a series of 10 consecutive song phrases of the *Tyrannus* × *Muscivora* hybrid. A-E were the first five; F terminated the series.

Other kingbirds in the Austin area used this same phrase with the same frequent repetition of the final figure. Recordings of this species in Oklahoma and California show this same pattern and variation of the dawn song. In none of these cases was there anything corresponding to the FM figure as shown in figure 1B and C in the final motif of the dawn song phrase.

In the case of *M. forficata*, the song phrase is likewise varied in no important respect, but an occasional individual will exclude the first figure in the terminal motif so that there will be only three figures in the motif. Also, at times the modulation of the frequency of the last figure (the FM figure) will be less even or smooth than in the case of figure 1C. It would seem from this that the pattern is as well fixed and stable in *M. forficata* as in *T. verticalis*. In all cases observed, the terminal motif ended with the FM figure.

Spectrograms were made of the terminal motif of a series of 10 consecutive song phrases voiced by the hybrid flycatcher at about 04:45 (CDT) on 4 June 1967. Six of these are shown in figure 2. This series was taken from about the middle of a reel of tape recorded between 04:15 and 06:00. In A there is a "wit" followed by a FM figure and then a terminal "wit." Here there is little evidence of modulation of the frequency of the carrier wave of the FM figure, and there is only one slight indentation in the spectrogram.

In B the FM figure is more like that of *M. forficata*, although not smoothly modulated (it has a weak introductory segment), and the first and last figures are again simple "wits."

In C we have a modified M figure which resembles those formed by *T. verticalis* more than one formed by *M. forficata*. (In all the spectrograms made, the M figures of the hybrid were of shorter duration than those of *M. forficata* and the second segment of the M was more sharply peaked and higher than any observed in *M. forficata* spectrograms; hence, they were more nearly like the M figures of *T. verticalis*.) Here the FM figure is rather smoothly modulated so that the warble wave is about 35 Hz, which makes the figure almost exactly like the one in figure 1B. The only difference is in the greater deviation of the carrier wave which indicates a somewhat greater force in the modulator. In this case, again, the final figure is a "wit."

Considering the final motifs of the 10 phrases as a group, there were seven out of the 10 ending with a simple "wit" and three ending with the FM figure as in the case of

M. forficata. The modified M figure was directly before the FM figure (as in *M. forficata*) in two of the cases, and was followed by a "wit" in all others. In cases (such as fig. 2F) in which there was almost no modulation of the frequency of the carrier wave in the FM figure, it is apparent that the basic or carrier wave is in the form of a simple "chip." The various examples show considerable variation in the success of modulation but in no case is the modulating frequency as high as that used by *M. forficata.* However, it is apparent that the hybrid achieved some modulation of the frequency of this figure but the modulation was weak. In no case did he modulate any other type of figure. Even greater confusion is indicated when we consider the whole series of motifs. No two consecutive motifs were alike and not one of them was similar to a typical phrase of either of the parent types. The frequent occurrence of the modified M type of figure indicates an influence of one or the other parent type, and the continual use of the FM figure indicates the effect of *M. forficata.* The use of three or four figures in the terminal motif conforms to the pattern of both parents, but the use of terminal "wits" again indicates intermediacy.

In our opinion, the above data offer the best evidence to support a hypothesis concerning the control of the length and structure of the motifs as well as the individual figures by multiple factors in birds with inherited voice patterns.

DISCUSSION

Wolfe (1956) defines the breeding range of *T. verticalis* in Texas as the central-western part of the state from Wichita and Dallas Counties southwest through Bexar County and the Trans-Pecos region; Peterson (1960) states that it breeds from the Panhandle and the Trans-Pecos east to Denton, Dallas, Waco, and Austin and south to Del Rio and San Marcos. *M. forficata* breeds throughout the state, with the exception of the extreme western Trans-Pecos region. The area of sympatry of these two species in Texas is increasing as the kingbird extends its breeding range eastward. In recent years it has been found nesting in Harris County (Audubon Field Notes 1959), Refugio County (ibid. 1961), Jim Wells County (ibid. 1964), San Patricio and Brazos Counties (ibid. 1965), and Hidalgo and Victoria Counties (ibid. 1966).

Webster discovered the first known nest of *T. verticalis* in Austin in 1955. The population increased steadily and now this kingbird is a regular summer resident in some parts of the city. Whereas this species tolerates—or even prefers—the urban environment as long as foraging space, dominant perches, and lofty nest sites are available, *M. forficata* requires more open space and has become less common within the city in recent years, although it remains common in adjacent rural areas. Thus, in Austin, the opportunity for interspecific contact is generally limited to islands of open space within the city, where territories of the two species may be contiguous. Near the hybrid nest site, several city blocks largely cleared for automobile parking would seem to provide marginal, if adequate, habitat for *M. forficata.* No resident individuals of this species were noted in this vicinity in 1966 or 1967.

Since individuals of both species are likely to return to nest in the same locality as the year before, the hybrid's presence in Austin suggests the return of a native. It is noteworthy that its arrival date falls between the average arrival dates of the (presumed) parent species. The hybrid was seen in the vicinity of the nest site eight days before the arrival of *T. verticalis* on 26 April, whereas the influx of *M. forficata* begins in mid-March (Simmons 1925; pers. observation) in the Austin area.

Assuming that the hybrid originated in central Texas, supposition as to its parentage must necessarily be narrowed to *T. verticalis* and *M. forficata. M. forficata* is the only extremely long-tailed and scissor-tailed flycatcher within the breeding range of *T. verticalis.* Beyond the local area, the opportunity for *M. forficata* to interbreed with other species closely related to and resembling *T. verticalis* is limited to *T. vociferans,* a summer resident of the highlands of west Texas, and *T. melancholicus,* generally confined to deep south Texas, both species being at extremities of the range of *M. forficata.* On the basis of morphology, it would seem that both *T. vociferans* and *T. melancholicus* are poor suspects as the *Tyrannus* parent of the hybrid since both lack white edges on the outer rectrices and white elsewhere in the tail; furthermore, *T. vociferans* has darker contour plumage and *T. melancholicus* has more extensively and intensely yellow underparts than *T. verticalis.*

The possibility of an aberrant or mutant individual has been considered. Since the hybrid most closely resembled *M. forficata,* tail length and the coloration of under body

plumage are immediately suspect. It has been pointed out that the tail was judged to be shorter than that of any first-year male *M. forficata* examined. It can be assumed that this shortness was not the result of accidental loss of feathers, for while the rectrices showed no signs of wear, no additional growth was made during the period of observation.

As for contour feathers, the yellow on *T. verticalis* is evenly distributed over the belly, flanks, and lower breast, whereas the pink or orange on the sides and belly of *M. forficata* is replaced by intense red or salmon-pink on the axillary patch. The yellow on the hybrid, while paler than in *T. verticalis*, lacked any noticeable regional variation in intensity of pigmentation. An examination of a series of skins of *M. forficata* showed a wide variation in the amount of red pigment in adult birds, but even the palest specimens had some pink or orange.

The chances that we have been concerned with an individual of *M. forficata* which simultaneously exhibited aberrancy (tail) and xanthochroism (pigmentation of under-side contour plumage) seem rather remote. In addition, we have related parts of the hybrid's inherited vocal patterns to both *T. verticalis* and *M. forficata.*

The existence of the hybrid, and its mating with *T. verticalis*, emphasize the close relationship between *T. verticalis* and *M. forficata* and support the proposal advanced by Smith (1966) that *M. forficata* be placed in the genus *Tyrannus.*

SUMMARY

A hybrid flycatcher was observed at Austin, Texas, between 18 April and 22 June 1967. During this period it paired with a female kingbird (*T. verticalis*). Nest-building was completed and incubation apparently had begun when the hybrid vanished.

This hybrid was morphologically intermediate between *T. verticalis* and *M. forficata.* Its vocalizations and behavior had characteristics common to both parent species.

The area of contact between the two species has increased with the eastward expansion of the breeding range of *T. verticalis.*

The existence of the hybrid and its mating with *T. verticalis* demonstrate the phylogenetic proximity of *M. forficata* and *T. verticalis.*

ACKNOWLEDGMENTS

We wish to thank R. K. Selander of the Zoology Department, University of Texas, for critical examination of the manuscript and the color transparencies, and for advice and suggestions which proved indispensable to the preparation of this account. We are deeply grateful to K. A. Arnold, Department of Wildlife Sciences, Texas A & M University, who granted us access to the study skins at the University, and to R. F. Johnston, Museum of Natural History, University of Kansas, who loaned us the museum's collection of *M. forficata* skins.

LITERATURE CITED

American Ornithologists' Union. 1957. Check-list of North American birds. 5th ed. A.O.U., Baltimore.

Gray, A. P. 1958. Bird hybrids. A check-list with bibliography. Tech. Commun. no. 13. Commonwealth Bur. Anim. Breed. Genet., Edinburgh.

Peterson, R. T. 1960. A field guide to the birds of Texas. Houghton Mifflin Co., Boston.

Simmons, G. F. 1925. Birds of the Austin region. Univ. of Texas Press, Austin.

Smith, W. J. 1966. Communication and relationships in the genus *Tyrannus.* Nuttall Ornithol. Club, Publ. no. 6.

Wolfe, L. R. 1956. Check-list of the birds of Texas. Intelligencer Printing Co., Lancaster, Pennsylvania.

Accepted for publication 31 July 1968.