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Received July, 1970.

SOME OBSERVATIONS ON THE VOCALIZATIONS OF THE EASTERN BLUEBIRD

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INTRODUCTION

During the course of my investigations of the population dynamics of the Eastern Bluebird (*Sialia sialis*) I have come to rely quite heavily on its song and calls as an aid in understanding the birds' behavior. Thomas (1946) has presented a brief summary on the vocalizations of this species, although her primary concern was with other aspects of the breeding behavior of bluebirds. Thus, in order to organize my own observations, recordings were made of the more common calls and material from my notes was extracted and is set forth in the following summary of bluebird vocalizations.

MATERIALS AND METHODS

Observations were made of both wild birds nesting at Stony Creek Metropolitan Park, Macomb County, Michigan, and of captive individuals I have kept at the park's Nature Center and at my home residence. The recordings were all made from three captive birds, two of which were taken as nestlings during the summer of 1969. The third bird, an adult female, was also captured during that year. These birds were kept for observation in a

5′ x 5′ x 6′ cage and were fed a steady diet of insects and wild fruits not unlike their natural food items. Occasionally artificial foods were offered, including mealworms, waxworms, mashed hard-boiled egg, commercially-prepared currants, and bits of lettuce. Insects captured during the summer were preserved for use in winter by freezing them in water to prevent dehydration. Four or five drops of ABDEC vitamins were added to the birds' drinking water once or twice a week.

The sounds were recorded with a Sony TC-102 tape recorder at 3 3/4 inches per second. The spectrograms were made on a Kay Electric Company Sonograph, model 661B, and were traced onto drawing paper to prepare the figures. I wish to thank Dr. William L. Thompson and Kenneth Shiovitz for their assistance in helping me prepare and interpret the sonographs.

No effort was made to isolate the laboratory birds and thus trace the ontogeny of vocalizations. It appears, however, that, with the exception of the song of the bluebird, all other vocalizations are not learned and that the birds are quite capable of uttering them and, with one exception, understanding the meaning which they convey. The vocalizations are summarized in Table 1.

TABLE 1. SUMMARY OF THE VOCALIZATIONS OF THE EASTERN BLUEBIRD

Vocalization	*Characteristics*	*When Appears*	*Context*
1. Song	long, varied; often preceded by introductory "cheer"	first breeding season	by male to attract female or to indicate intrusion of territory by another bird or predator (human)
2. Tu-a-wee	loud; easy to locate, well-defined	12-14 days	"Here I am"(to give location)
3. Chuck	abrupt; wide frequency range; varying with intensity of alarm stimuli	after fledging	attack (possibly thwarted); not used by nestlings
4. Upp	slurred; hard to localize; narrow frequency range; does not vary with intensity of alarm stimuli	probably about time of fledging	"Take cover"
5. Whine	easy to localize	after fledging	distress or frustration, usually by male
6. Scream	loud and emphatic; harsh-sounding	11-14 days	given by birds held in hand
7. Peep	abrupt and short	from hatching to 4-6 days	before and while being fed; tactile stimuli
8. Zeee	longer; harsh-sounding	second thru fifth weeks	before and while being fed; visual or auditory stimuli

DESCRIPTION OF THE VOCALIZATIONS

The Song. The song of the bluebird seems to serve primarily the function of mate attraction. It is also used, to a lesser extent, for territory proclamation and for distress communication. In this last respect it differs in purpose from that of other passerines.

Males commence to sing upon their arrival in our area in March, and may utter as many as 20 songs per minute prior to the arrival of their mates. Often this early singing is delivered while the bird is in flight in a manner suggestive of the Bobolink (*Dolichonyx oryzivorus*), with the bird flying slowly and appearing quite uncertain about its destination. Occasionally, a "continuous song" is delivered, in which case the males may sing for as much as a half an hour without interruption. This is most common in spring and I have noted it as a prelude to copulation and from two males which were apparently disputing rights to a single newly-arrived female. With the arrival of the females, however, singing diminishes considerably (5-10 songs per minute) and stops completely with the onset of incubation.

My previous impressions were that the territorial behavior of the bluebird was not accomplished principally by singing, and this might be expected in a brilliantly-colored songbird. This result might be, however, inaccurate owing to the fact that the bluebird is currently at a sub-optimal population density, and that territories are sufficiently dispersed to prevent much in the way of territorial disputes. This year, however, several pairs nested in close proximity to one another, and on one occasion the arrival of a new male did much to provoke the song of two other males that had nests nearby. Singing subsided soon, with the first resident birds apparently coming to accept their new neighbor.

For reasons not clearly understood, bluebirds frequently break into full song when they are disturbed. I have noticed this several times while checking boxes and the birds' behavior left little doubt that the singing represented a form of protest of my presence. This "anger song" is often more abrupt than the complete singing which one often hears from a male singing to attract a female, and often consists of merely the introductory *cheer* which regularly precedes the usual song. I have noted, however, complete songs from both males *and females* in a disturbed context. This occurred most often when I was checking the nesting box of a breeding pair which had eggs or young. In males, it often grades into the distress "whine" while in females it often alternates with the alarm "chuck" (see below).

Location Note. The characteristic *tu-a-wee* apparently serves the function of alerting the members of a pair, a family group, or a flock to the presence of one another. It is most noticeable when the birds are in flight or are in a more heavily wooded area where visibility is poorer than in open areas, and seems to be more common in females than males. Young birds first utter this call at 12-14 days of age, and it does not appear to be learned as I have noted it in captive birds taken at 5 days of age. Fledglings just

Figure 1. — The more well-defined calls of the bluebird which are easy to localize, including a) the location note and b) the whine.

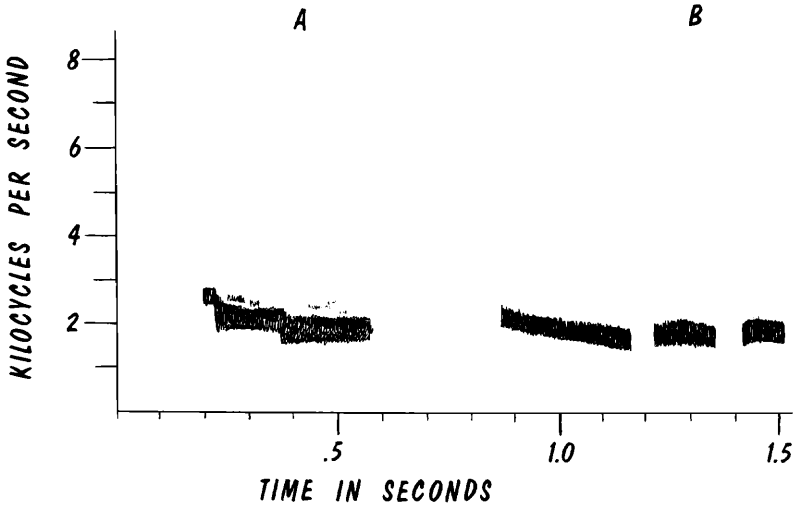
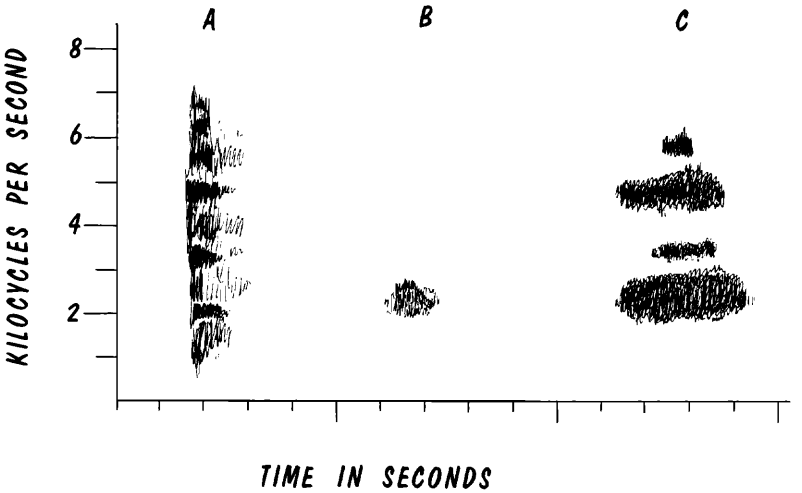


Figure 2. — Bluebird vocalizations which are not well-defined and are difficult to localize: a) alarm chuck, b) "upp", and c) the scream.



out of the nest alert their parents to their location by giving this call, and after a period of prolonged absence by both of the parents, young that have recently fledged call more loudly and the location note can be heard nearly a quarter-mile away! Apparently it serves a variety of purposes, then, all of which seem to be an attempt to communicate one bird's presence to others. In addition, while

weighing nestlings I have noted that this call alarms the parents and induces nestmates to assume a low crouch (protective) position.

This seems to be the most characteristic call of this species and is very constant in the form of its delivery by different individuals. Its low pitch (Fig. 1a) and rather abrupt beginning make it an easy call to locate, and thus in form it serves well as a location note. As expected, this call elicits the gaping response in nestling bluebirds and I have noted that adults utter it when arriving at the nesting box with food.

Chuck. This call is given in alarming situations and seems to vary considerably in the speed of delivery with the intensity of the alarm stimuli. The recording was made from my captive birds by placing a stuffed owl in the cage. Apparently the ability to emit this call is inherited, as is the ability to recognize certain appropriate stimuli. I have noted this call in captive birds in unusual situations, as when I have placed large numbers of beetles (e.g., June Bugs) in the cage. Evidently it corresponds to the "see" call of the European Blackbird (*Turdus merula*) and Snow (1958) states that it expresses the tendency to attack. This tendency in bluebirds may or may not be thwarted, as I have observed attacking individuals come within inches of the top of my head while uttering this call.

Despite its wide frequency range, the "chuck" is an easy call to localize, perhaps because of its sharp beginning, as shown in figure 2a. It is thus also used by parent birds when an intruder goes near the nest, presumably in an attempt to divert the attention of a would-be predator away from the nest and to express the tendency to attack. It is interesting that young juvenile bluebirds of an early brood will respond with this call (and often attack) when an intruder goes near the nest of a second brood being reared by the same parents. I have occasionally noted it while holding adults for banding. It does not appear to be a part of the nestling repertoire, however, as young bluebirds are not capable of attacking at the pre-fledging stage.

Upp. This is the call most often given by startled birds as they take flight and it has the effect of inducing flight in other individuals. The meaning of this call apparently, then, is one of "Take cover," and I have yet to observe it from a bird that did not fly off or was crouched low as if about to. Birds that take flight but are not disturbed do not utter this call. As can be seen in the sonograph (Fig. 2b), this call is quite slurred, having a very indistinct beginning and ending. It also has a very narrow frequency range, and for these two reasons it is very difficult to localize. There is no change in the rate of delivery of this call with a change in motivation.

Whining. This seems to be a general call given by a (usually male) bluebird in response to a distressful situation or as a sign of frustration. I once noted it from a male perched atop a nest box while his mate, apparently to his displeasure, rested up in a tree nearby, presumably frightened by my presence. Thomas

states that this call is often given by females as a preliminary to coition or when a nest is lost to a predator. I have also noticed it from my captive birds when choice food items are placed in the cage and one bird alights at the food tray and does not tolerate other birds around it. Thus, the exact purpose of the call is somewhat vague. It is, however, very well defined and easy to localize (Fig. 1b) and is thus intended for other birds to notice. I have never noticed it from a lone individual, as is the case with the "upp" note.

Scream. While handling both adults and nestling birds I have noted a very harsh-sounding, loud, and emphatic scream which I have never noted at any other time in adult birds although I once heard a fledgling give this call as it flew to evade an attack by a male Redwing (*Agelaius phoeniceus*). Needless to say the adult —in this case the male—responded by launching a vicious attack at the assailant, successfully driving him away.

The alarm scream appears to be the most intense of the alarm vocalizations, and apparently is given in the most alarming of all circumstances, viz., when the bird is in immediate danger of being caught by a predator. It is noteworthy that, during my banding operations, I have noticed that some females give this call louder and more frequently than others. These more vocal females are also more likely to desert their nests. It seems safe to conclude, then, that the alarm scream varies in intensity and in frequency of delivery with the nature of the alarm stimuli.

When given by nestlings an alarm scream induces the adults to attack the intruder vigorously, and the same effect has been observed while I am holding one of the members of a nesting pair of adults. As is the case with the similar Indigo Bunting (*Passerina cyanea*) call of *Eeee* noted by Thompson and Rice (1970), this call consists of a series of overtones and of one sustained fundamental (Fig. 2c).

We must keep in mind that, as was first noted by Nice (1943), a bird giving an alarm note is not "telling" other birds of danger, since most of them "warn" when alone. The screaming of nestling bluebirds, however, does accomplish this end, and it seems certain that this behavior pattern evolved for the purpose of warning others. Interestingly the response of other nestlings to the alarm scream of one seems to be learned, whereas the call itself is innate. When one nestling screams, the others scatter for safety, but only after learning to associate this call with danger. Nestlings I have reared and that are fearless of people do not react when a wild bird screams if the only apparent sign of danger is a human.

Nesting Calls—Peep and Zeee. From the time of hatching and continuing for the first week or so of its life the young bluebird emits a *peep* which varies in rate of delivery and is not unlike the earliest vocalizations of other passerine species. This call is most common while the eyes of this species are closed and the young often respond with it to tactile stimuli such as tapping on the nest. It often accompanies gaping and feeding and ceases after a feeding;

thus it appears to be an indication of hunger. I have never noted it from an unhatched or partly-hatched egg, but it is given by the young immediately upon hatching. After about five days, however, the young bluebird begins to develop its vision and simultaneously develops a second call, a harsher sounding *zeee*. It is significant that the earliest stimuli that initiate this call are not tactile, as is the case with the *peep* which precedes it, but instead are primarily visual and auditory. Peeping does not induce the *peep* in other nestlings, whereas the *zeee* call by one nestling stimulates others to give this call.

While brooding nestlings under an artificial light I was able to induce the *zeee* as well as gaping in hungry individuals by extinguishing the light or making a banging noise. Presumably both of these circumstances arise when the parent bird alights at the cavity or nest box entrance with a morsel of food; i.e., she makes a thumping sound and the cavity immediately becomes dark as she enters. Later on, as the young approach two weeks of age, I have noted hand-reared individuals gaping and calling as I approached them, and this continues until four to five weeks of age, with the adults normally feeding fledged young in response to it. Juvenile bluebirds of an early brood respond to this call by feeding hungry and calling young of a later brood. With my captive birds I have noticed juveniles feeding when they were between 38 and 62 days of age. Even adult bluebirds do not always respond to a gaping young bird. The reproductive activities of my captive birds are regulated by artificial light and I have found that only adults that are in breeding condition will respond to gaping and calling. Others ignore it, thus indicating that the proper endocrine state is prerequisite for an adult to be stimulated by this call.

It is significant that the switch from the *peep* call to the *zeee* call coincides not only with the change in the stimulus which induces calling and gaping, but it is also at this time that the homeothermic mechanism begins to function in the young. Thus, brooding by the female becomes less and most of the feeding from here on is done by the male bluebird. This might suggest that the dual nature of the nestling calls motivates each of the parents differently. During the second week, while the *zeee* call predominates, females cease to brood and frequently begin new nests while males feed more and assume progressively greater care of the young until after fledging, at which time they take complete control of their new family. During the first week, when the peeping calls predominate, females often feed the young and then brood, while the males often transfer food to the young by giving it first to the brooding female. More research is needed on this point, however.

Both the *peep* and *zee* calls vary in frequency and volume with hunger. I once noted a group of five nestlings nine days old calling noisily in response to the banging of the cardboard box I often carried as a wind shield while weighing the young. It was cold,

rainy, and foggy, and had been for two days, and the nestlings had gained little weight during this time. Their calls were loud and frequent and could be heard over fifty feet away. Unfortunately, these calls under this curcumstance served another function other than the principal one of stimulating the parents to feed. The next day all that remained of the starving family were a few feathers, one wing, and a bird house badly scarred by raccoon claws. One can only assume that excessive calling by under-fed nestlings accomplishes a useful, natural purpose in population regulation. Weak and starving birds attract the attention of predators, and their elimination enables the parents to immediately begin a new nest.

SUMMARY

The form and function of the vocalizations of the Eastern Bluebird are described, with an emphasis on depicting the meaning and significance of each.

Singing behavior occurs most often when males seek to attract females, and at such times singing is frequently given in flight, presumably to enable the bird to advertise over a greater area. Full song may also be the result of a potential territory threat by another bird or may be an expression of alarm, in which case it is given by either sex. A "continuous song" and "anger song" are special variations of the normal singing behavior.

The location note, alarm chuck, scream, and whine are all calls that are easy to localize but each occurs in a somewhat different context. The "upp" call is given as a bird takes flight and is very difficult to localize. It induces other birds to fly off and apparently alerts them to danger they may not be aware of.

Two distinct nestling calls are used, the *peep* and the *zeee*, and these vary in time of occurence and type of stimulus which induces them. It was suggested also that each elicits a different response in each parent.

Excessive calling by underfed nestlings serves also to attract predators, thus fulfilling a selective function at times, viz., to eliminate the weaker or starving young.

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Received September, 1970.