FOODS OF EASTERN BLUEBIRD NESTLINGS IN NORTHWEST TENNESSEE

T. DAVID PITTS
The University of Tennessee at Martin
Martin, Tennessee 38238

ABSTRACT

A study of the foods of nesting Eastern Bluebirds (Sialia sialis) was conducted on an Obion County farm in 1974 and 1975. Adults were observed feeding nestlings in nest boxes attached to observation blinds. Primary foods were caterpillars, grasshoppers, spiders, and crickets. The availability of food was determined by periodically checking plots on the study area; potential food items increased in number and size from April through September. Both male and female parents fed nestlings, but the male made fewer deliveries during the latter part of the nesting stage.

INTRODUCTION

Studies of the feeding habits of Eastern Bluebirds (Sialia sialis) include reports by Forbes (1880), Beal (1915), and Judd (1900) based on the examination of stomach contents. A recent report on nesting foods (Pinkowski, 1974a) was based on observations of adults feeding nestlings, both in captivity and in the wild, for many hours over a period of three years in Michigan. As part of a continuing study of the ecology of bluebirds near the geographic center of their range, this study deals with the abundance of potential food items and their consumption by nesting bluebirds.

METHODS AND MATERIALS

The study area, a 20 ha cattle farm in Obion County, Tennessee, consisted of well-drained, rolling hills with four small (0.5-2.0 ha) patches of woodland. Festuca (Festuca elatior), Ispedea (Ispedea stricta), and white clover (Trifolium repens) were the most common pasture plants. Bluebirds were common permanent residents; most nests were in nest boxes which had been available in the study area since 1958.

Two plywood observation blinds 1.2 m long, 0.6 m wide, and 1.5 m high were erected on the study area in December 1973. A nest box (cavity approximately 12 x 12 x 20 cm) was attached to one end of each blind. An observation cone extended into the blind from an opening (10 x 10 cm) in the back of the next box. The large end of the cone was open and was secured to the nest box; the small end of the cone was covered except for a 1 cm diameter hole through which the nest could be viewed. This arrangement allowed observation of activities in the nest but prevented the bluebirds from seeing into the blind. An entering adult normally perched in the entrance (3.8 cm diameter) and little light entered. A 3 cm hole was cut in the roof of the next box to increase visibility; this hole was covered with a thin, translucent sheet of plastic to block direct sunlight and rain.

To measure food availability during the nesting season, 11 plots (0.6 x 0.6 m) were studied. The plots were selected from areas where bluebirds had been observed gathering food for nestlings. Although all of the plots were in grassland, each plot was unique; some plots were on ridges, some were in valleys, and others were on variously facing slopes. Each plot was surveyed 8 times in 1974 and 7 times in 1975. All plot surveys were made during midday on clear days, and all plots were surveyed in rapid sequence to assure reasonably constant environmental conditions. During a survey, each plot was inspected for 3 minutes for items that could be used as bluebird nesting food. Each potential food item was identified in the field, and its length was measured or estimated.

RESULTS

During 1974 three nests were observed for 112.05 hours, and in 1975 three nests were observed for 32.40 hours. Food items most frequently delivered to young were caterpillars, grasshoppers, spiders, and crickets (Table 1). In addition to these primary foods, adults delivered moths, cherries, honeysuckle, a variety of beetles, millipedes, grubs, earthworms, termites, and a number of small items which I could not identify. The largest item delivered was a skink (probably Eumeces laticeps) approximately 10 cm in length; it was promptly swallowed by a fully grown nesting. Sometimes winged and appendages were removed (by battering the items against limbs), but usually all appendages were still attached to the food items when they were delivered to the young. All items were swallowed without difficulty by the bluebirds were about 10 days old, but during their first 10 days nestlings frequently had to struggle to swallow some of the larger items, particularly Orthoptera with appendages.

TABLE 1: Food items delivered to nesting bluebirds.

<table>
<thead>
<tr>
<th>Date</th>
<th>Observation time (hours)</th>
<th>Number of items delivered</th>
<th>Grasshoppers</th>
<th>Crickets</th>
<th>Spiders</th>
<th>Caterpillars</th>
<th>Moths</th>
<th>Other*</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>13.5</td>
<td>140</td>
<td>7.9**</td>
<td>10.7</td>
<td>5.7</td>
<td>58.6</td>
<td>2.9</td>
<td>14.3</td>
</tr>
<tr>
<td>June</td>
<td>70.5</td>
<td>546</td>
<td>22.2</td>
<td>11.9</td>
<td>17.6</td>
<td>21.1</td>
<td>4.0</td>
<td>23.3</td>
</tr>
<tr>
<td>July</td>
<td>27.5</td>
<td>168</td>
<td>27.9</td>
<td>20.2</td>
<td>25.0</td>
<td>17.3</td>
<td>0.0</td>
<td>9.5</td>
</tr>
<tr>
<td>August</td>
<td>33.0</td>
<td>235</td>
<td>27.7</td>
<td>19.6</td>
<td>13.6</td>
<td>19.6</td>
<td>0.0</td>
<td>19.6</td>
</tr>
<tr>
<td>Totals</td>
<td>144.5</td>
<td>1089</td>
<td>22.4</td>
<td>14.7</td>
<td>16.3</td>
<td>25.0</td>
<td>2.4</td>
<td>19.2</td>
</tr>
</tbody>
</table>

* Includes less numerous items and those not identified.

** Percentage of monthly total.

*** Number delivered.

During the first three days following hatching, nestlings received slightly smaller food items than during the remainder of the nesting period (Fig. 1A). The size of nesting food items increased gradually, but with considerable variation. The role of the male declined gradually throughout the nesting period (Fig. 1B).

![FIG. 1. Average size of food items delivered to nestlings, percentage of food items delivered by the male parent, and daily variation in the rate at which food items were delivered to nestlings.](image)

Feeding rates, expressed as the number of food items a nesting received each hour, did not follow any pattern of decrease or increase during the nestling period. Fig. 1C, which is based on 107.55 hours of observations of broods of four, shows the variation which existed. Young were usually fed several items shortly after dawn; during the remainder of the day, feeding periods and periods of inactivity alternated as the adults rapidly fed the young and then failed to appear for periods of 30-60 min.

![FIG. 2. Monthly comparisons of the abundance of three major bluebird food items on survey plots and the occurrence of these foods in the diets of nesting bluebirds.](image)

Adults normally delivered one food item per trip. On only five trips, of 1089, did I observe two or more
items in the bill of an adult. Three of these trips in- 
volved terns which were apparently swimming near-
by. Adults appeared to feed the nestling which stretched 
and opened its beak widest. Young which were 
gorged still responded by gaping when a adult appeared 
with food. However, if the food item was placed in 
the mouth of such a nestling it could not swallow and the 
adult quickly removed the item and placed it in the 
mouth of another young. Following a period of intense 
feeding, all of the young were usually satiated and none 
could swallow additional items; in such cases the adults 
usually swallowed the item after several futile attempts 
to feed it to the young.

TABLE II: Texas and frequency of food items on survey plots.

<table>
<thead>
<tr>
<th>Item</th>
<th>1974</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Arthropoda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthoptera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grasshoppers</td>
<td>447</td>
<td>68.6</td>
</tr>
<tr>
<td>Crickets</td>
<td>58</td>
<td>8.9</td>
</tr>
<tr>
<td>Misc.</td>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>Homoptera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leafhoppers</td>
<td>47</td>
<td>7.2</td>
</tr>
<tr>
<td>Coleoptera</td>
<td>14</td>
<td>2.1</td>
</tr>
<tr>
<td>Diptera</td>
<td>8</td>
<td>1.2</td>
</tr>
<tr>
<td>Hymenoptera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ants</td>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>Misc.</td>
<td>11</td>
<td>1.8</td>
</tr>
<tr>
<td>Hemiptera</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Lepidoptera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>3</td>
<td>0.5</td>
</tr>
<tr>
<td>Caterpillars</td>
<td>6</td>
<td>0.9</td>
</tr>
<tr>
<td>Arachnida</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiders</td>
<td>30</td>
<td>4.6</td>
</tr>
<tr>
<td>Aneilida</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earthworms</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Unidentified</td>
<td>5</td>
<td>0.8</td>
</tr>
<tr>
<td>Total</td>
<td>652</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The only recent major study of the food habits of birds is that of Pinkowski (1974a). He found 84% of 
nestlings to consist primarily of Lepidoptera (adults and larvae) 36.0%; Orthoptera (primarily crickets and 
grasshoppers) 22.0%, spiders 11.3%, and beetles 11.0%; many other items from various taxonomic 
groups were also consumed. The major difference be-
 tween results of this study and those of Pinkowski 
(1974a) is in the number of Orthoptera and Lepidoptera 
delivered. In both studies two different groups were 
the most important food items, but I observed Orthoptera 
being fed more frequently (37%) than Lepidoptera 
(27%); the converse of Pinkowski's results. My few ob-
servations of beetles and earthworms, snails being fed. Pinkowski (op. cit.) suggested that snails and 
millipedes might supply calcium to the nestlings and I did observe millipedes being delivered 
on several occasions. Fudd (1900) found primarily 
beetles, Orthoptera, Lepidoptera, spiders, and a few 
in the stomachs of nestling bluebirds.

Vertebrates. Beal (1915) mentioned the presence of 
lizard and frog bones in the stomachs of bluebirds, but 
these birds were apparently adults; Flanigan (1971) 
observed an adult bluebird kill and eat a snake and 
Pinkowski (1974b) observed a bluebird kill and consume 
a small bird.

Beal (1915) found the primary animal foods of adults 
smaller than 1.0 g to be mostly insects, in the form of 
grasshoppers, beetles, and ants (3.48%); additional 
items included Hemiptera, milli-
pedes, spiders, and earthworms. Plant foods 
were made up of 32% of the diet of the adults 
and consisted mainly of fruits and seeds (Beal, 1915). 
Plant foods were consumed primarily during the winter 
months. The type of food items delivered by adults 
to nestlings does not differ greatly from the normal diet 
of the adults with the exception of the greater number 
of beetle larvae in the diet of the adult.

In most respects my results and those of Pinkowski' 
(1974a) are in agreement. However, shortly after 
hatching, young are more likely to be fed small prey, 
especially spiders, and that the male makes fewer 
trips to the nest in the latter part of the nesting stage.

However, some differences do exist between Pink-
owski's (op. cit.) results and mine. Pinkowski (op. cit.) 
found an increase in the rate of feeding in the nestlings 
grew; my data do not show an increase in the rate 
of feeding, but they do show a general increase in the 
size of the food delivered, (Fig. 1A). Perhaps the larger 
prey compensated for the increased requirements of 
the nestlings on my study area. Pinkowski (op. cit.) 
observed that frequency of nest visits by the adult 
may be increased to young after the tenth day; I did 
not observe any increase in the rate of delivering two or 
more items per trip. I observed delivery of more than 
one item per trip so infrequently that I believe it to be 
of rare occurrence in my study area. Pinkowski (op. cit.) 
stated that feeding of nestlings was infrequent 
early in the morning but peaked in mid-morning and 
at dusk. I found high feeding rates early in the morning 
followed by a mid-morning lull. Possibly the warmer 
early morning temperatures in Tennessee permit more 
efficient bluebird feeding on active insects, thus account-
ing for the differences.

**LITERATURE CITED**


