

NOTES ON PROTOCALLIPHORA DURING THE
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I WAS unable to make any further study of the effect of the blood-sucking larvæ of *Protocalliphora* on nestling birds during 1929. Lester W. Smith, of Babson Park, Massachusetts, reported that in the spring of 1929 a cold spell of weather probably added to the loss of Bluebirds and Tree Swallows, but estimated that probably eighty per cent of the first brood of Bluebirds died from the effects of the blood-sucking larvæ. The young of the Tree Swallows have been found dead less frequently than those of the Bluebirds although the blood-sucking larvæ were present.

A Bluebird's nest was sent to me by Mr. Smith May 19, 1930. The five well-feathered nestlings were dead. The nest contained 148 puparia, from which emerged 135 flies, *Protocalliphora sialia* Shan. and Dobr. No parasitism of the puparia by the little chalcid *Mormoniella vitripennis* Walk. (*brevicornis* Ashm.) was evident. One small tachinid, *Plectops pruniosa* Mall. was among the other flies.

Referring to a Bluebird's nest received from William P. Wharton of Groton, Massachusetts, May 14th, Mr. Wharton says: "There were originally five young birds. When I looked at the nest a week or so later with a view to banding, I found four recently dead, and the live one had six or seven maggots attached to it. Probably the old birds had deserted the nest in this instance, for the surviving nestling was later found dead in the new nest which I had placed in the box." From the nest sent me 57 flies (*Protocalliphora sialia*) appeared, but the parasite of the fly was not present.

On May 25th Mr. Wharton sent another nest with the following note: "The nest sent you yesterday was that of a Bluebird in which two young hatched about six days ago. On finding a maggot on one of the birds yesterday, I decided the best thing to do was to remove the nest and send it to you

¹ It is the policy of the editorial department of *Bird-Banding* to restrict its contributions to articles and notes which to an important extent are based on bird-banding work or on related methods of research. This paper of Mr. Johnson's comes within this category since bird-banders as a part of their activities collected the nests and parasites serving as the basis of the paper as well as accompanying data of scientific interest.—EDROR.

and make a new nest for the young birds." The nest contained larvæ that changed to 60 puparia, from which emerged 25 flies; 27 of the puparia were parasitized, and 18 were dead. The larvæ were small, but little more than half grown, and without further food produced a brood of small flies. This brood shows one interesting feature in that the larva of the fly is parasitized by the little chalcid when about half grown, but destroys the fly when in the pupa stage. All the puparia that have been parasitized can be readily recognized by little holes in the puparia through which the chalcids have escaped. Another Bluebird's nest was received from Mr. Wharton, June 17th. Four of the five young birds were dead. The nest contained 74 larvæ, 10 of which were put in alcohol; 64 pupated, and from these 52 flies emerged, while 5 were parasitized and 7 were dead. The nest contained many larvæ of a flea—*Ceratophyllus* sp.

On May 19th Mr. A. W. Higgins, of Rock, Massachusetts, sent a Bluebird's nest, the five nestlings having been killed by the larvæ of *Protocalliphora*. Mr. Higgins counted 219 larvæ in the nest. There were two series of maggots, the large ones that were ready to pupate and the smaller ones that were about half grown. Of the entire lot 143 pupated, from which emerged 98 flies of *Protocalliphora sialia*. No parasites of the fly were present.

A second Bluebird's nest was received from Mr. Higgins July 1st. The nestlings managed to live notwithstanding the fact that Mr. Higgins counted 184 maggots. When I examined this nest there were only 72 puparia, but two flies emerged, 61 of the puparia were parasitized, and 9 were dead. This was another remarkable case of parasitism, similar to the second nest sent by Mr. Wharton. Both represent the second brood of the Bluebirds, evidently indicating that the little chalcid is not present or is ineffective during the time of the first brood.

In a third nest built by the same pair of Bluebirds about July 10th, Mr. Higgins says, "no maggots of the *Protocalliphora* were present." Was this due to the effective work of the parasite in the second brood, so that the flies of *Protocalliphora* were not present to oviposit in the third brood, or was it owing to the lateness of the season?

Under date of July 28th Lester W. Smith writes: "I found a Bluebird using a box for second brood with practically no nest material in the box. A few blades of dry grass circled the inner edge of the box, leaving the four eggs on the bare wood at least half an inch from the grass. This was just

before my vacation. On my return I found one well-feathered body of a young bird in the nest, and evidence in dung that the others had been reared and had flown. Not a single pupa-case of *Protocalliphora* was in the nest, and what caused the death of the young bird was uncertain. Do you suppose this absence of a nest was intentional on the part of the adult birds in order to escape from the *Protocalliphora*?"

A Tree Swallow's nest received from Mr. Smith June 23d contained 44 puparia; 2 flies emerged, 39 were parasitized and 2 were dead. A House Wren's nest contained 4 small puparia from which the flies emerged and escaped. A second Wren's nest contained 2 small puparia, both parasitized.

In a letter dated August 11th, Charles L. Whittle, of Peterboro, New Hampshire, says: "I am sending you a Bluebird's nest with one dead young bird, all the nest contained. In the bottom of the nest are live maggots." On examining the nest I found 26 maggots, all of which pupated by the 15th. Under date of August 14th Mr. Whittle writes: "Regarding the pair of Bluebirds of the nest I sent you, may I add that this last nesting was their fifth attempt to raise a family this season and the only case where the eggs hatched? The four other nests were abandoned during incubation. One clutch had five eggs with embryos about half grown. It is a mystery why the nests were abandoned. In only one case was the nest found slightly disturbed. Is it likely that maggots could so annoy the adults as to cause them to abandon the nest?" This seems to me quite likely, especially if they attempted to build in bird-houses from which the old nests had not been removed.

A letter was received from Miss Helen Robinson, of Brewer, Maine, dated June 2d, in which she says: "I am sending a Bluebird's nest for examination as I suppose it is infested with the larvæ of *Protocalliphora*. The five young birds died at the age of eight days." The nest received represented only the upper portion and no larvæ or puparia were present. The maggots usually hide in the daytime in the lower part of the nest.

Mrs. R. B. Harding obtained from the nest of the Redstart, at Holderness, New Hampshire, June 27th, puparia from which emerged 16 flies, all representing the typical *Protocalliphora splendida* Macq. This is the third instance where Mrs. Harding has obtained only the typical form from warblers' nests, the others being obtained from the Black-throated Blue and Chestnut-sided Warblers. As only the typical *sialia* was found in all the nests of the Bluebird, Tree Swallow, Barn Swallow, and Crested Flycatcher, I am inclined to doubt that

sexual dichromatism exists, at least in this section and think that we are dealing with two distinct species.

On August 10th Mrs. Harding also obtained some more *P. splendida* from the nest of a Redstart, and on the same date *P. splendida* from the nest of a Blue-headed Vireo, a new host for the fly.

Mr. Wharton, asked as to the results of his removing the old nests and replacing them with new ones, says: "The experiment of removing the maggot-infested nests and substituting a clean one seems to have worked out very well. In three cases where I changed the nests of the Bluebirds the outcome was not so successful, but the failure of the young to survive was not due to the parents not feeding the young. The nest of May 25th was changed while all the young were alive, and the old birds were noticed feeding them very soon afterwards. When I inspected the box five days later it was empty. In view of the age of the young when the nest was changed it seems unlikely that they could have left the box fully fledged. I am inclined to think that some enemy carried them out. At any rate the outcome does not indicate a failure of the method for combatting *Protocalliphora*. In the nest of June 16th three out of the four young were found dead. After the nest was changed the parents continued feeding the survivor. On June 18th I banded the nestling, and it seemed all right, but on June 30th I found it dead. From indications I assume it died from digestive trouble. I still think that this method has considerable possibilities, especially if the change can be made before the young have been much weakened by the attacks of the blood-sucking maggots of *Protocalliphora*."²

The above records show conclusively that the greatest loss to nestling Bluebirds due to the blood-sucking larvæ of *Protocalliphora* is during the first brood. A cold, wet spring will only increase the loss, as the vitality of the young birds is

²Since writing the above I received from Mr. Wharton on August 22d the following letter: "The nest I am sending by this mail is that of a pair of Bluebirds which are trying to raise a brood for the third (possibly fourth) time. I changed the nest today, although the young are only four or five days old. I have seen no sign of maggots. If you find none I shall be surprised, for, as you know, there has been an epidemic of them here." The nest contained 118 maggots varying in size from 2 to 5 mm., many of the larger ones being filled with blood. The final outcome of this brood of Bluebirds is described by Mr. Wharton in a letter dated September 5th: "The Bluebirds left the nest probably this morning for one was looking out last evening and early this afternoon the nest was empty. I saw one of the young sitting on the barn roof near its parent. I am sending the nest to you by this mail, for there are some maggots and pupæ in it. I do not know whether those could have developed since the nest was changed on August 21st, if not they may be some which were overlooked when removing the original nest."

From this nest there emerged a large number of parasites but no flies. From many of the puparia flies had emerged. This would indicate that there were puparia from two different nests.

greatly lessened by the loss of blood. It also shows that the puparia of the flies are not, or are rarely, parasitized by the little chalcids at that time. This substantiates what I have previously stated, that the first nests should all be destroyed either as soon as the maggots of the flies are detected or as soon as the fledglings have left the nest.

From the dates of capture of the flies in the field and the habits of a number of allied muscid flies, there is no doubt that *Protocalliphora* hibernates as an adult and awaits the arrival of the birds in the spring to oviposit in their nests. Specimens of the fly taken at various places bear the following dates: Colebrook, Connecticut, Sept. 5th, (W. M. Wheeler); Southwest Harbor, Maine, Sept. 6th, (C. W. Johnson); Little Black River Rapids, Maine, Sept. 8th, (J. A. Cushman); Brookline, Massachusetts, Sept. 29th, (C. W. Johnson); Rumney, New Hampshire, Dec. 22d, in a dead pine, (P. J. Darlington, Jr.); Concord, Massachusetts, Jan. 10th; Wellesley, Massachusetts, Apr. 13th, (A. P. Morse); Colebrook, Connecticut, Apr. 19th, (G. C. Wheeler); and Sherborn, Massachusetts, May 4th, (E. J. Smith).

The large percentage of puparia parasitized in the Bluebird's nest sent by Mr. Wharton May 25th, also in the one sent by Mr. Higgins July 1st, and in the Tree Swallow's nest sent by Mr. Smith June 28th is most gratifying, but as a whole there seems to be less parasitism than in previous years.

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