MAGGOT INFESTATION OF NESTLING MOURNING DOVES

By JOHNSON A. NEFF

In 1936 the writer became interested in the migration of Mourning Doves (*Zenaidura macroura*) in California and, with the aid of carefully selected cooperators, began the large-scale banding of nestling doves. Among the collaborators was Calvin Stevens of Le Grand, California, who stated that he had frequently found large maggots attacking nestling doves and mockingbirds. It was decided that a special study of maggot infestation in Mourning Doves be undertaken. With the assistance of Mr. Stevens, T. D. Southward of Le Grand, and L. E. Macomber of Modesto, the writer gathered data on the problem in Merced and Stanislaus counties in the San Joaquin Valley of California. Although the study as originally planned was never completed, some items of information obtained during the years 1936 to 1940 seem to merit publication.

Attack by maggots of blowflies (*Protocalliphora*) upon nestling birds has been reported in the literature. E. O. Plath, reporting on observations in the vicinity of Seattle (1919a) and Berkeley (1919b), listed nestlings of the Nuttall Sparrow, Song Sparrow, Robin, Willow Goldfinch, Green-backed Goldfinch, Cedar Waxwing, Russet-backed Thrush, Spotted Towhee, Brown Towhee, Cliff Swallow, Yellow Warbler, and House Finch as hosts of maggots. He concluded that the maggots preferred inhabiting moist fecal material; that at pupation they crawled down through this material to the bottom of the nest and attached themselves there; that dense nests were more heavily infested because maggots fell out of lighter nests; that maggots attack only at night or in poor light; and that partially grown maggots invariably died when removed from a source of food.

In the East, Johnson (1927) quotes Contant as concluding that the maggots attacked whenever hungry, and Stoner (1936) found that they fed freely during the day in nests of Bank Swallows. Thomas (1936) stated that tight nests or box nests were more heavily infested because maggots fell out of loose nests. At points in the East, at Seattle, and at Berkeley, investigators reported that many nestlings were killed by maggots. According to Thomas, parasites of the wasp family Chalcididae are a factor in control of maggots.

Species attacked.—In our studies, no maggots were found in the several nests inspected of the House Finch, Barn Swallow, Black Phoebe, Song Sparrow, Black-headed Grosbeak, Green-backed Goldfinch, Lawrence Goldfinch, nor in any of several thousand nests of Tri-colored and Red-winged blackbirds. Maggots were, however, found in the nests of English Sparrow, Mockingbird, California Shrike, Western Kingbird, and Mourning Dove. Of these, apparently the English Sparrow, California Shrike, Western Kingbird, and Mourning Dove had not been listed previously as hosts in the literature.

Season of infestation.—It appeared that the bulk of the attack occurred between May 20 and July 20. Many infested nests were found by June 1, while after July 10 it became increasingly difficult to find nests containing maggots.

Degree of infestation.—During 1938 and 1939 the infestation was severe. On one occasion in 1938, 12 nests out of 30 inspected were badly infested, while on another day 17 out of the 36 nests inspected were found infested. In 1939, out of 70 nests inspected, 37 were found infested. During the entire period, 1936-1940, in the course of banding

operations, we found that there was a high mortality in nestling doves, and our observations led us to suspect that this mortality might be attributed to the maggot infestion in large part.

From the flimsy nests of Mourning Doves the number of maggots obtained ran from a low of 20 to a high of 86, with the average running over 40. Obtaining mature maggots from such nests is simple, as it is only necessary to hold a hat or pan under the nest which is then moved gently. The maggots will roll off the supporting branch and out of the nest material into the container. Small immature maggots must be hand-picked off the nestling.

Concealment.—In these frail nests the majority of maggots crawl down through the sparse material and rest on the top of the supporting branch. This location is never entirely dark during the day.

Manner of attack.—Small maggots were found in the ears, nostrils, among pin-feathers, on wings and tail, in angles of wings and legs, and occasionally elsewhere. On larger birds the more nearly mature maggots seemed to attack freely the ventral surface and the tarsi and feet.

Little visible effect was noted until the maggots were at least half-grown. Then attacks upon the tarsi showed plainly, with old wounds showing as small dark circular scabs one to two millimeters in diameter. Sometimes there would be as many as ten to each tarsus. Fresh wounds showed as small circular glistening spots where the exposed tissue had not yet formed scabs. In badly infested nests the ventral surface of the nestlings frequently was discolored with dried blood and maggot excreta, and at times even the nest material under the young birds showed the same discoloration.

When the maggots were hungry, they attacked at any time of day, though they preferred darkness or dull light. In one experiment maggots were fasted by removal of the nestlings and upon their replacement the maggots immediately crawled up through the nest and attacked, even in bright sunlight. Feeding to satiation was accomplished within as little as fifteen minutes, after which the maggots released their hold and a pin-head drop of blood appeared at the suction point. Some force was required to remove a hungry maggot when it had just begun to feed.

Action of infested doves.—On July 10, 1938, Stevens watched two nestling doves, evidently in discomfort, roll, kick, and squirm upon their frail platform. Picking them up he found five maggots attached to one of the nestlings. Next morning both were found dead beneath the nest, one with three maggots still attached, and it was inferred that both had fallen from the nest while trying to dislodge the maggots from bellies and legs. In other nests the nestlings were observed kicking about in identical manner.

In another experiment, large nestlings were removed from a badly infested nest and a three- or four-day-old nestling was substituted. It was quickly attacked and finally fell off the nest as it tried to move away from the attack. Close inspection disclosed small maggots in ears, nostrils, and among the pin-feathers. These were apparently the newly-hatched maggots that infested its own nest, not those that had attacked in the experimental nest.

A newly-deserted dove nest was removed intact from its location and placed in a small box. Using fresh groups of maggots to reinfest this nest from time to time, several Mourning Dove nestlings were placed in it and the box darkened with a cover. Upon each occasion the maggots crawled up through the nest and attacked the young dove. Under stress of this attack even four-day-old nestlings finally squirmed their way off the nest and onto the floor of the box, and older nestlings worked their way to the farthest corner. Maggots remained attached until the lid of the box was removed after

the nestling was heard scrambling about. When daylight entered the box, they usually dropped off the bird and tried to crawl to concealment.

One heavily infested nest was found in which one nestling showed signs of attack; the second nestling, in poor condition and marked by maggot attack, was on the ground underneath the nest still attended by one of the adult birds.

Moist fecal material had no part in the activity of the maggots. In the dry summer air of the San Joaquin Valley fecal material is rapidly desiccated and soon falls to the ground. Tests with moist pigeon fecal material aroused no activity among the maggots.

Effect upon doves. Banding studies in this section of California had disclosed a heavy loss in young doves. In one instance where careful records were kept, the young of only 18 nests out of slightly over 100 grew to bandable age. Other records showed similar heavy losses.

No dead nestlings were ever found in nests. Nestlings were seen to fall from their nests as they sought to dislodge the irritating maggots, and two were found dead on the ground soon after they had been seen fighting the maggots. Artificial tests had further proved that the young doves would scramble from the nest to avoid the attack.

Circumstances prevented determining the extent of the loss specifically due to this attack, but the writer feels that a considerable portion of the loss in young doves after hatching may be due to falling from the nest in trying to dislodge these maggots. Once on the ground there is little chance for survival, as feral house cats, skunks, opossums, snakes, and other predators are common in the area.

Pupation.—In the dense nests of other birds pupation occurs in the bottom layers of the nest material, but in the frail nests of the Mourning Dove no puparia were ever found. Under one badly infested nest the ground was hard, though covered with fully two inches of litter. A three-foot circle was drawn on the ground immediately under this nest and when the litter therein had been carefully removed puparia were found well scattered over the hard ground surface.

Another badly infested nest was located over well-disced soil, the top eight inches of which were soft, with hard soil underlying at the 8-inch level. A circle thirty-six inches in diameter was drawn about a point under this nest and the soil was then carefully removed, inch by inch. A total of 42 puparia was recovered, the majority of them lying between four and six inches deep in the soft soil. While a few were found in the upper four inches, more had penetrated to between six and eight inches, and none had gone into the hard plow-pan below the eight-inch depth. This observation was repeated with similar results.

Puparia hatched on the tenth day after pupation.

Species of fly.—Specimens from a number of the San Joaquin Valley nests were sent to Dr. David G. Hall of the U. S. Bureau of Entomology for identification. Those from nests of the mockingbird, shrike, kingbird, and sparrow were identified as *Protocalliphora metallica* (Townsend), one of the well-known and widely-distributed species, while all specimens collected from the nests of Mourning Doves and from the soil underneath these nests were identified as a new and undescribed species. In a revision of the blowfly family Calliphoridae now in press, Dr. Hall describes this new species and proposes a new generic name for the American blowflies heretofore assigned to *Protocalliphora.*

Natural controls.—Many maggots fall to the ground before maturity, and none of these survive. All fall to the ground to pupate. In numerous instances maggots were shaken to the ground for observation where large red and black ants abundant in the

area were seen to seize and carry them away. To this extent ants may well serve as a valuable check.

Some lots of puparia were found heavily infested with parasites, and in certain lots every individual was so affected. From puparia sent to him Dr. Hall identified this parasite as the chalcid wasp, *Mormomiella vitripennis*.

SUMMARY

Blowfly maggots parasitizing nestling Mourning Doves in the San Joaquin Valley of California were identified by Dr. David G. Hall as an undescribed species, while all those found in nests of other species of birds were identified as *Protocalliphora metallica*.

Attack of these maggots upon nestling Mourning Doves appeared to be an important factor in nest mortality in this area between 1936 and 1940. Nestlings fell to the ground as they attempted to dislodge the maggots. Specific studies on the extent of loss actually due to this factor were not made.

The frailty of nests of Mourning Doves does not appear to be a hindrance to this parasitism, since as many as 85 maggots were found in a single nest. When mature they fall to the ground and pupate under debris on top of hard soil, or in the top eight inches of soft soil. The pupal period was found to be ten days. Hyperparasites of the species *Mormomiella vitripennis* were abundant at times. Ants were seen carrying away maggots that had been shaken to the ground.

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