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TECHNICAL NOTE

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Black Soldier Fly (Diptera: Stratiomyidae) Colonization of Pig Carrion in South Georgia

ABSTRACT: The black soldier fly, *Hermetia illucens* (L.), is thought to colonize corpses 20–30 days postmortem. However, recent observations indicate this might not be true for all cases. Therefore, we conducted a study examining colonization by the black soldier fly and other Diptera on pig carrion in a plowed field in southern Georgia from 20 September through 21 February. Our data indicate black soldier flies could colonize a corpse within the first week after death. Knowing this information could prevent a serious mistake in estimating the time at which a corpse is colonized by this species. This study also represents the first record of *Chrysomya rufifacies* in Georgia.

KEYWORDS: forensic science, decomposition, entomology, Diptera, *Hermetia illucens*, *Chrysomya rufifacies*

Forensic entomology is the study of insects and their use in forensic investigations ranging from the medicolegal to stored products and structural damage (1). Primarily, with regard to the medicolegal aspects, entomology is used for estimating the postmortem interval, or time of death, of a corpse based on the development or succession of arthropods on it (2,3). Determining time of death with entomological techniques is often dependent on data published on the decomposition process of carrion.

The black soldier fly, *Hermetia illucens* (L.), is a large (13 to 20 mm) wasp-like fly (4). It has three generations per year in the southeastern United States and can be collected from late spring through early fall, depending on weather conditions (5). It is not a common fly to colonize a corpse, and in most cases where it has been collected, it is considered a late colonizer (6,7).

Research on the black soldier fly has primarily focused on its larval stage. The time of development from the egg to the post-feeding stage can vary depending on the food resource and corresponding environmental conditions. May (4) recorded larval development occurring in 31 days at 27.8°C. Tomberlin et al. (8) examined larval development on three diets and determined the larval stage lasted 22 to 24 days at 27°C, and adults emerged after an additional 18 to 21 days at this temperature. Recent studies indicate that the larval resource, and not temperature alone, affects the rate of larval development. Although preliminary, Tomberlin (unpublished data) found that black soldier fly larvae reared at 27°C on lean pork need approximately 40+ days to reach the post-feeding larval stage. This time frame is twice as long as previously determined for larvae reared on a standard house fly larval diet (8).

We conducted a study examining insect colonization of carrion in southern Georgia from September through February. Our observations focused on the occurrence of the black soldier fly and other dipteran species on the carrion.

Materials and Methods

The experiment was conducted in a 10 × 15 m fallow field located in Tifton, Georgia. Local grasses and weeds surrounded the plot, and a hardwood forest was located approximately 100 m to its north. The plot was plowed 10 days prior to conducting the experiment.

The Department of Animal Sciences, The University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia, provided three domestic pigs, *Sus scrofa* Linnaeus, each weighing approximately 18 kg, for the study. At ≈0800 hr on 20 September 2000, each pig was killed with a single 0.22-caliber gunshot to the back of its head (The University of Georgia Animal Welfare Assessment #: A3437-01) and placed individually on a welded 81-cm^2 wire (1.27 cm^2) platform (9) under a 91 × 91 × 66 cm cage constructed with polycoated 2.5-cm^2 mesh to exclude vertebrates. All cage locations in the plot were randomly selected and were separated by ≥1 m.

Daily observations were made between 1200 and 1400 h from 20 September through 21 February. Carcasses were examined for fly maggots that could be used to estimate the minimum postmortem interval of a corpse. Dipteran larvae collected from the carcasses were placed on approximately 25 g of beef liver in 37-mL medicine cups (3–5 larvae/cup) (The Solo Co., Urbana, Illinois), capped with a breathable lid (Stanpac Inc. Smithville, Ontario Canada), labeled, and stored in a rearing room at 27°C, 70–80% RH, and 16:8 [L:D] h. Collected and reared adults were identified to the lowest taxonomic level possible. Representative specimens were placed in The University of Georgia Museum of Natural History.

Results and Discussion

Larvae of *Chrysomya rufifacies* (Macquart) (Diptera: Calliphoridae) and *Chrysomya megacephala* (Fabricius) (Diptera: Calliphoridae), *Cochliomyia macellaria* (Fabricius) (Diptera: Calliphoridae),

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Sarcophaga bullata (Park) (Diptera: Sarcophagidae), and *Hermetia illucens* (L.) (Diptera: Stratiomyidae) were collected from the carcasses. These data represent the first record of *C. rufifacies* in Georgia, whereas *C. megacephala* was first recorded in 1999 (10). *Chrysomya megacephala* and *C. rufifacies* were introduced into the continental United States from Brazil and Costa Rica, respectively, and are now the primary colonizers of carrion in the southern United States (2). *Cochliomyia macellaria* is the primary colonizer of carrion during the summer in South Carolina (11,12), and possibly was also in Georgia prior to the introduction of *C. megacephala* and *C. rufifacies* (13). In regards to the black soldier fly, Lord et al. (7) indicate this fly typically colonize human remains 20–30 days postmortem. However, we observed two black soldier flies ovipositing on a carcass 6 days after initiating the experiment, and post-feeding larvae were present by day 54. Nelder and McCreadie (personal communication) observed black soldier flies ovipositing in August outside Mobile, Alabama, on alligator carcasses that had been dead between 4 and 14 days.

Conclusions

A significant find in our study was that carrion located outdoors in southern Georgia can have black soldier fly eggs on it as early as the first week after death, which differs from information previously reported. Knowing this information could prevent a serious mistake in estimating the time at which a corpse is colonized by this species. However, continued efforts documenting black soldier fly colonization of carrion are needed to determine the frequency of this event.

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