

## Interdisciplinary Workshop Yields New Entomological Data for Forensic Sciences: *Chrysomya rufifacies* (Diptera: Calliphoridae) Established in North Carolina

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**ABSTRACT** Workshops are used for educating law enforcement personnel on the application of entomological, anthropological, and botanical techniques to gather forensically important information from a body recovery site. From 8 to 11 June 2004, such a workshop was conducted in the metropolitan area of Charlotte, NC, by the American Academy of Applied Forensics at Central Piedmont Community College. For this workshop, three pig carcasses weighing individually between 40 and 60 kg were placed in the field 4 June, whereas three pigs similar in size were placed in the field 7 June. During the afternoon session on 11 June, workshop participants collected three *Chrysomya rufifacies* (Macquart) (Diptera: Calliphoridae) third instar larvae from a pig carcass placed in the field on 7 June. These data represent the first records of this forensically important insect in North Carolina; furthermore, these data provide evidence of this species expansion into new geographic regions of the United States. This finding is an example of the benefits derived from an experiential and interdisciplinary approach to educating death scene investigators. Learners acquired new knowledge, put it into practice through the “body” recovery exercise, and ultimately contributed to science by way of the discovery and first documentation of a forensically important insect previously not known to inhabit North Carolina.

**KEY WORDS** forensic science, workshop, *Chrysomya rufifacies*

Forensic science workshops provide an experiential learning environment (Kolb 1984, Rogers and Freiberg 1994) where instructors develop and facilitate exercises that focus on the learner’s subjective experience. Workshops go beyond didactic teaching methods, where the goal is to transmit knowledge of certain facts, in that they provide situations where methods and techniques can be applied or practiced. This form of learning is essentially for law enforcement personnel who have one chance to collect evidence, such as entomological, botanical, human remains, and or weapons/personal effects, at crime scenes. Once the crime scene is investigated, the integrity of the site is sacrificed. Therefore, all relevant information and evidence must be gathered during the one and only opportunity.

Because the features and evidence documented and collected from crime scenes vary, an interdisciplinary approach to training law enforcement personnel is highly effective. Simulations of death scenes contain-

ing decomposing/skeletonized remains, forensically important insects, and relevant botanical specimens, for example, replicate what is typically found in real-life death scenes. These simulations afford the workshop participants the opportunity to apply their skills with the guidance of experts; thus, the learning experience is more meaningful. Moreover, workshop “experiential” death scenes, with their requisite field exercises, have often resulted in discoveries of new forensically important information for one or more of the target disciplines. This short communication relays one example of such a finding as it pertains to forensic entomology with possible medical–veterinary applications as well.

*Chrysomya rufifacies* (Macquart) (Diptera: Calliphoridae) was introduced to the United States during the 1980s (Wells 2000). At the time, entomological opinion was that the historical tropical range of the species would limit its distribution to the extreme southern United States. However, forensic entomologists have successfully monitored the spread of this predacious and cannibalistic species throughout most of the United States, even into the northern climates common to Michigan (Shahid et al. 2000) and southern Ontario, Canada (S. VanLaerhoven, personal communication). Therefore, this species has expanded its range more quickly and much further than expected. This information has been directly applied to forensic

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entomology casework throughout the United States. We collected *C. rufifacies* during a workshop in Charlotte, NC. These data represent the first records of this forensically important species in North Carolina.

### Materials and Methods

From 8 to 11 June 2004, an interdisciplinary workshop was conducted in the metropolitan area of Charlotte. The American Academy of Applied Forensics at Central Piedmont Community College hosted this workshop, which combined entomology, anthropology, and botany sessions. In preparation for this workshop, three pig, *Sus scrofa* L., carcasses weighing individually between 40 and 60 kg were placed in the field 4 June, whereas three pigs similar in size were placed in the field 7 June. The carcasses were placed at three sites. Two of the sites, separated by  $\approx 20$  m, were in a wooded lot, whereas the remaining site was in a sunlit area  $\approx 10$  m from the nearest wooded site. Two carcasses, one from each kill date, were placed  $\approx 1$  m apart at each site. Voucher specimens are currently maintained at the American Academy of Applied Forensics at Central Piedmont Community College.

### Results and Discussion

Twenty-one investigators from South Carolina and North Carolina participated in the workshop. During the afternoon session on the last day of the workshop, participants collected three *C. rufifacies* third instar larvae from one pig placed in the field on 7 June. These data represent the first record of this forensically important insect species in North Carolina.

During the past three decades, four species of Old World *Chrysomya* Robineau-Desvoidy (Diptera: Calliphoridae) have been introduced into the New World (Wells 1993) with *C. rufifacies* first being reported in Costa Rica in 1978 (Jiron 1989). Since its introduction, it has spread throughout North America and has been collected in southern U.S. states, such as Texas (Richard and Ahrens 1983) and Alabama (Wells 2000). It also has been collected in more northern locations, such as Nebraska (Figorola and Skoda 1998) and Michigan (Shahid et al. 2000). The taxonomy for *C. rufifacies* has been well described for the adult (Shahid et al. 2000) as well as the larval stages (Tantawi and Greenberg 1993).

This fly is of particular importance to forensic entomologists because of its unique larval biology. First

instars of *C. rufifacies* feed directly on decomposing tissue, whereas second and third instars can serve as facultative predators of other fly larvae present (Shahid et al. 2000). Because of this predation, it is frequently the sole calliphorid species present on human remains at the time of collection.

The interdisciplinary nature of workshops allows participants to understand the role of entomology, anthropology, and botany as they pertain to forensic investigations. Additionally, conducting such workshops can allow participants to discover and record new scientific information pertinent to the forensic sciences. As an example, the new entomological information gathered during the workshop described herein may have implications for body decomposition patterns and rates in North Carolina and could lead to new research ideas to further contribute to forensic science applications.

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