

CASE REPORT

BLOW FLY MAGGOTS (DIPTERA: CALLIPHORIDAE) FROM A HUMAN CORPSE IN A VEHICLE

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Abstract. Correct species identification and development data of insects associated with a cadaver can help estimate the time of colonization which could be used to infer a minimal post-mortem interval (minPMI) for forensic investigations. Human remains are found in a variety of locations ranging from open fields to inside automobiles. We report the investigation of blow fly larvae collected from a decomposing body located in the trunk of a car. There were two blow fly (Diptera: Calliphoridae) species: *Achoetandrus rufifacies* (Macquart) and *Chrysomya megacephala* (Fabricius). Blow flies can enter the vehicle and colonize human remains. Based on age estimations of third stage larvae of *A. rufifacies*, the minPMI was estimated to be 4-5 days, which was within the range of 3-5 days estimated by other forensically relevant information.

Keywords: forensic entomology, post-mortem interval, *Achoetandrus rufifacies*, blow flies, automobile

INTRODUCTION

Human remains can be discovered in a variety of environments ranging from open fields to concealed places such as automobiles. Although approximately 30 forensic entomology cases have been examined in northern Thailand (Sukontason *et al*, 2007), none have been

discovered in an automobile that were recorded. Although such cases are rarely reported, entomological evidence coupled with the findings of the forensic autopsy are often jointly helpful to determine the time of death (Anderson, 2001; Hitosugi *et al*, 2007; Williams, 2008). Case studies can provide information about arthropod colonization of human remains providing guidance with future death investigations. We present here data regarding the use of entomological evidence from a forensic investigation in Thailand involving the remains of a woman located in an automobile. This case demonstrates the use of entomological evidence with other

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Table 1
Occurrence of *A. rufifacies* among human corpse in Thailand^a.

Species	Number of cases		PMI estimation ^b
	Indoor	Outdoor	
<i>A. rufifacies</i>		1	Yes
<i>A. rufifacies</i> + <i>C. megacephala</i>	1	3	No/Yes ^c
<i>A. rufifacies</i> + <i>C. megacephala</i> + <i>Chrysomya villeneuvei</i>		2	No
<i>A. rufifacies</i> + <i>C. megacephala</i> + <i>Lucilia cuprina</i>		1	No
<i>A. rufifacies</i> + <i>C. megacephala</i> + <i>Synthesiomyia nudiseta</i>	1		Yes
<i>A. rufifacies</i> + <i>C. megacephala</i> + <i>Lucilia cuprina</i> + <i>Sarcophaga</i> spp		2	No
<i>A. rufifacies</i> + <i>C. megacephala</i> + <i>Coelonomomyia nigripes</i> + <i>Megaselia scalaris</i>		1	Yes
<i>A. rufifacies</i> + <i>Piophilha casei</i> + <i>Hydrotaea spinigera</i> + <i>Sargus</i> spp + <i>Dermestes maculatus</i>		1	No
<i>A. rufifacies</i> + <i>C. megacephala</i> + <i>Sarcophaga</i> spp	1		No

^aSukontason *et al* (2007) from northern Thailand.

^bBased on age of *A. rufifacies*

^cSritavanich *et al* (2009) from Khon Kaen Province, northeastern Thailand.

evidence to determine the minimum post-mortem interval (minPMI) of the deceased individual.

CASE REPORT

The nude body of a female was discovered in the trunk of a car (Honda, Japan) parked near a bamboo forest in Chiang Mai Province during the summer of 2013. The remains were severely bloated, blackened, with partial skin loosening on the arms and fingers. At autopsy done at the Department of Forensic Medicine, Chiang Mai University, maggots were found scattered along the body, especially on the face, neck and along the inside of the victim's thighs. The fly larvae were identified as third instar blow flies (Diptera: Calliphoridae): *Achoetandrus rufifacies* (Macquart) and *Chrysomya megacephala* (Fabricius) with *A. rufifacies* being the most developed. Therefore, age

estimates of these larvae were 4-5 days. This estimate was within the range of 3-5 days provided by other forensic finding to determine the minPMI.

DISCUSSION

Little information is published regarding forensic cases involving the concealment of remains within a vehicle (Anderson, 2001). The case presented here illustrates that *A. rufifacies* and *C. megacephala* can successfully colonize human remains concealed in the trunk of a vehicle. The results generated from this case are in agreement with Anderson (2001) who observed a large number of blow flies in a vehicle in British Columbia. She concluded the flies gained access to the remains via many entrances, including drainage holes in the trunk. She suggested that the car itself did not provide much of an obstacle. Apparently, a number of

different species of fly larvae in British Columbia were collected from the remains in the car trunk, such as blow flies [*Lucilia (Phaenicia) sericata* (Meigen), *Phormia regina* (Meigen), *Protophormia terraenovae* Robineau-Desvoidy and *Calliphora vomitoria* (L.)]; flesh flies (Sarcophagidae) [*Liopygia argyrostoma* Robineau-Desvoidy]; and skipper flies (Piophilidae) [*Stearibia nigriceps* (Meigen) and *Piophila casei* (L.)].

A. rufifacies is one of the most common species of blow flies found on dead bodies, often arriving within 10 minutes of death (Goff, 2000). In our case our estimate fell within the 3-5 days estimation developed in conjunction with other forensically relevant information. However, in similar circumstances of concealed death scenes, such as wrapping, delay in the arrival of flies to oviposit may be encountered. Voss *et al* (2008) determined blow fly colonization of vertebrate carrion was delayed within a car by 24-28 hours. Research in Malaysia found wrapping monkey carcasses (macaques) in rice sacks (made from plastic mesh) delayed the arrival of forensically important flies by 1 to 13 days depending on species (Ahmad *et al*, 2011). It was also reported in Malaysia that in an enclosed environment, fly arrival may be delayed by 1-3 days (Nazni *et al*, 2011). More research is needed to explore the insect arrival and oviposition in a vehicle death scene, so the most accurate estimate of minPMI can be made.

Our finding support a previous study that both *C. megacephala* and *A. rufifacies* are flies commonly associated with human death scenes both inside human dwellings and in open environments in urban, suburban, rural and high elevation areas in Thailand (Sukontason *et al*, 2007). This is also similar to forensic cases reported from Malaysia (Cheong *et al*, 1973; Lee *et al*, 2004; Kumara *et al*, 2012; Kavitha *et al*,

2013), Taiwan (Shiao and Yeh, 2008), Hawaii in the USA (Goff and Odom, 1987; Goff *et al*, 1988), and Colombia (Barreto *et al*, 2002). In Panama, both these species of blow flies are found along with *Cochliomyia macellaria* (Fabricius) from human remains (Sergio Bermudez and Pachar, 2010). These findings are also similar to a report from Chiang Mai, Thailand (Ngoen-klan *et al*, 2011). In Nakhon Sawan Province, Thailand, *A. rufifacies* was the most abundant species found on chicken remains and *C. megacephala* was the second most abundant (Dr Kittikhun Moophayak, unpublished).

This case demonstrates more than one species can colonize human remains concurrently in Thailand (Table 1). This finding is similar to reports from Malaysia (Lee *et al*, 2004; Kumara *et al*, 2012) and Panama (Sergio Bermudez and Pachar, 2010). Therefore, it is recommended investigators not assume single species occurrence. Care should be taken to identify all larvae sampled from human remains. This approach is important since different species may develop at different rates. If larvae are incorrectly assumed to be a single species, the estimate of the minPMI could be less accurate.

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