Research Note

First report of the house fly larvae, Musca domestica (Linnaeus) (Diptera: Muscidae) associated with the monkey carcass in Malaysia

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Abstract. A study on insect succession of monkey carcass in a forested area in Ulu Gombak, Selangor, Malaysia was conducted from 9 May to 18 June 2007. The third instar of the housefly, Musca domestica (Linnaeus) (Diptera: Muscidae) were only found on dry stage of a decomposed (Day-33) monkey carcass (Macaca fascicularis Raffles). This observation revealed that M. domestica maggots were found together with other muscid fly maggots, Hydrotaea (=Ophyra) spinigera (Stein) (Diptera: Muscidae) on dry stage of a carcass. However, the role of M. domestica on forensic entomological study remains unknown. This study recorded the first finding of M. domestica maggots on primate carcass in Malaysia.

The house fly, Musca domestica (Linnaeus) (Diptera: Muscidae) is cosmopolitan in distribution and reported to exist wherever man has established himself (Omar et al., 2003). Adults and maggots of this fly can be found in fisheries, slaughter houses, vegetable farms, market places, garbage disposal sites and poultry farms (Bohart & Gressitt, 1951; Byrd & Castner, 2001; Nazni et al., 2003); while the oviposition of M. domestica on human corpses are rare (Greenberg, 1971; Smith, 1986).

In Malaysia, maggots of M. domestica were never reported from any entomological specimens from human corpses. However, this was in contrast to the finding of Lectercq (1969) in Europe where the first wave of fly larvae in cadavers were inclusive of M. domestica. Reviews on forensic entomological cases of human corpse in Malaysia by Lee (1989, 1996), Hamid et al. (2003), Lee et al. (2004) and Salleh et al. (2007) showed that there were no evidence of infestation by M. domestica maggots on human cadavers so far. On the other hand, Vitta et al. (2007) and Heo et al. (2007, 2008a) reported that adults of M. domestica visited pig carcasses (Sus scrofa Linnaeus) in the early stages (fresh stage and bloat stage), but no maggots of M. domestica were recovered from their studies. Heo et al. (2008b) reported the occurrence of M. domestica eggs on pig carcass but no maggots were found from their study.

This paper reports the first record of M. domestica larvae recovered from a primate carcass in Malaysia.
A study on insect succession was conducted from 9 May to 18 June 2007 (rainy season) to determine successional fauna using monkey carcass in a forested area in Wildlife Research Centre, University of Malaya, 16th Mile of Gombak District (3º17’57.86”N, 101º47’00.78”E), Selangor, Malaysia. The study site was a secondary forested area with very low human populations and activities. The nearest human dwelling was approximately 300 meters from the study site.

The monkey carcass was used as a model for human decomposition since they are phylogenetically related to humans. At the beginning of field study, a monkey (1 replicate, 3 year olds, 4.5 kg) was euthanized by a single shot to the forehead from a handgun at point blank. Euthanization was administered by personnel of the Department of Wildlife and National Parks (PERHILITAN), Peninsular Malaysia, Ministry of Natural Resources and Environment, Malaysia. The study protocol was approved by Institute for Medical Research’s Unit of Animal Care and Use Committee [ACUC/KKM/02(2/2008)]. No faeces and urine of the carcass were observed after the monkey was euthanized. After death was confirmed, monkey carcass was immediately placed indoor on a cemented ground of a wooden hut [10 ft (length) x 10 ft (wide) x 10 ft (height), that had 4 windows on each side of the wall] in the forest. The windows of the wooden hut were open throughout the study period to allow flies access into the hut.

The carcass was monitored hourly for the first 3 days (10 minutes for each hour), and daily from day 4 onwards until no more larvae and bones were observed from the carcass. A representative sample of larvae infested on different parts of the monkey carcass was collected in order that the natural populations were not disturbed. Larvae were collected by using forceps and immediately placed and killed in glass vials containing 70% ethanol. One collection was done daily in the morning about 10 am. All the specimens were preserved in 70% ethanol and transported back to the Laboratory of Medical Entomology Unit, IMR for mounting and identification.

About 50% (minimum of 5 specimens of each species) of the total daily collected larvae were mounted according to the method described by Lee et al. (1984). All adults and larvae were identified using the taxonomic keys of Kurahashi et al. (1997), Ishijima (1967) and Greenberg & Kunich (2002).

The species of maggots obtained from different decomposition stages of monkey carcass are showed in Figure 1. No flies’ and larvae’ activities were observed on the carcass for the first 3 days of post mortem. On Day-4 (bloating), adults of Chrysomya villeneuvi Patton and Chrysomya chani Kurahashi (less than 10 flies) were observed visiting the carcass, and egg mass was observed on the eyes and mouth regions of the carcass. However, no larvae were found on the Day-4. On Day-5 (bloating) and Day-6 (bloating), second instar of Chrysomya pinguis Walker, Ch. villeneuvi and Ch. chani were collected from the carcass, indicating these three species of blow flies were the early colonizers on carcass placed indoor in forested area. Pupae of Ch. villeneuvi and Ch. chani were found on and around the carcass from the Day-10 (advanced decay) onwards.

The third instar of Musca domestica were only found on Day-33 (remains stage) of a decomposed monkey carcass. A total of 6 maggots of third instar M. domestica were collected from the monkey carcass. No first instar, second instar and puparia of M. domestica were recovered from the carcass. Our study shows that M. domestica maggots were found together with another muscid fly maggots, Hydrotaea (=Ophyra) spinigera Stein on dry stage of a carcass. Musca domestica maggots were not obtained after this. Hydrotaea spinigera maggots were the dominant colonizer in the dry stage, and the occurrence of M. domestica may cause interspecific competition between both species of maggots. However, no study has been conducted on interspecific competition between these two species.
According to Smith (1986), *Hydrotaea* maggots are predaceous in the second and third instars, and frequently attack other maggots living in the same medium including *M. domestica* and other Muscidae. Only the occurrence of the third instar *M. domestica* observed in this study might be probably due to the predation by *H. spinigera*, thereby accounting for the complete absence of the maggots thereafter.

The occurrence of *H. spinigera* maggots in the decomposition stage of corpse and/or carcass is varied. As in this study, this fly was found associated with monkey carcass in the decay to dry stage. Smith (1986) reported that *Hydrotaea* usually appears in human corpses during the period of ammonical fermentation (decay), and 4 – 8 months (dry) after death. Besides, Byrd & Castner (2001) also reported that other species of *Hydrotaea* (*H. aenescens* Wiedemann and *H. leucostoma* Wiedemann) maggots usually appear during the late or active decay stages on human cadavers. In Thailand, the third instar of *H. spininera* was collected from a mummified human corpse, approximately 3 – 6 months of decomposition (Sukontason et al., 2001a). On the other hand, Omar et al. (1994a) reported that *H. spinigera* was a major colonizer of monkey carcasses when the carcasses were already in decay stage, approximately 3 to 6 days after the carcasses were placed. Our finding was similar to previous works (Sukontason et al., 2001b; Heo et al. 2008a) in that the third instar of *H. spinigera* were found on the carcass on decay and advanced decay stage (~ day 7 – 8th).

Heo et al. (2008b) reported the oviposition of *M. domestica* eggs on fresh pig carcass and concluded that this species maybe was an early visitor. This contrasted with our study in which the *M. domestica* maggots were only observed on remains stage. Thus, the occurrence and role of *M. domestica* in forensic entomological study remain unclear. More studies should be conducted to investigate the role of *M. domestica* as an indicator in forensic entomological study.

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![Figure 1. Maggots recovered from monkey carcass (*Macaca fascicularis* Raffles) placed in forested area in Ulu Gombak, Selangor (3°17'57.86"N, 101°47'00.78"E) from 9 May to 18 June 2007. One monkey carcass was used in this study](image-url)
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