

Opportunistic Insects Associated with Pig Carrions in Malaysia (Serangga Oportunis Berasosiasi dengan Bangkai Khinzir di Malaysia)

HEO CHONG CHIN*, HIROMU KURAHASHI, MOHAMED ABDULLAH
MARWI, JOHN JEFFERY & BAHARUDIN OMAR

ABSTRACT

Flies from the family Calliphoridae, Sarcophagidae and Muscidae are usually found on human cadavers or animal carcasses. However, there are many other families of Diptera and Coleoptera that were found associated with animal carcasses, which have not been reported in Malaysia. In this paper, we report dipterans from the family Micropezidae: Mimegralla albimana Doleschall, 1856, Neriidae: Telostylinus lineolatus (Wiedemann 1830); Sepsidae: Allosepsis indica (Wiedemann 1824), Ulidiidae: Physiphora sp. and a beetle (Coleoptera: Hydrophilidae: Sphaeridium sp.) as opportunist species feeding on oozing fluid during the decomposition process. They did not oviposit on the pig carcasses, therefore, their role in estimation of time of death is of little importance. However, they could provide clues such as locality and types of habitats of the crime scene.

Keywords: Acalytrate; Coleoptera; Diptera; forensic entomology; pig carrions

ABSTRAK

Lalat daripada famili Calliphoridae, Sarcophagidae and Muscidae adalah biasa dijumpai di atas mayat manusia ataupun bangkai haiwan. Akan tetapi, banyak lagi famili Diptera dan Coleoptera yang berasosiasi dengan bangkai haiwan masih belum dilaporkan di Malaysia. Dalam karya ini, kami melaporkan Diptera daripada famili Micropezidae: Mimegralla albimana Doleschall, 1856, Neriidae: Telostylinus lineolatus (Wiedemann 1830); Sepsidae: Allosepsis indica (Wiedemann 1824) dan Ulidiidae: Physiphora sp. dan sejenis kumbang (Coleoptera: Hydrophilidae: Sphaeridium sp.) sebagai serangga oportunist pada bangkai khinzir dimana mereka menjilat cecair yang mengalir keluar semasa proses pereputan. Serangga ini tidak bertelur pada bangkai khinzir. Oleh sebab itu, mereka tidak memainkan peranan penting dalam penganggaran waktu kematian. Walaupun begitu, kehadiran serangga ini dapat memberikan maklumat seperti lokasi dan jenis habitat berkaitan dengan tempat kejadian jenayah.

Kata kunci: Acalytrate; bangkai khinzir; Coleoptera; Diptera; entomologi forensik

INTRODUCTION

Two major groups of insects are predictably attracted to cadavers and provide vital information in forensic investigation; beetles (Coleoptera) and flies (Diptera) (Byrd & Castner 2001). However, many other types of arthropods are found in association with dead bodies, but these are typically opportunistic feeders taking advantage of the circumstances. They are made up of both scavengers feeding on decaying materials and predators feeding on the species that have colonized the carrion (Smith 1986).

In Malaysia, flies of forensic importance on human corpses or animal carcasses are made up of three major families: Calliphoridae, Sarcophagidae and Muscidae (Heo et al. 2007; Lee et al. 2004; Omar et al. 1994). Although several fly species belonging to different genera were found on human cadavers, the predominant species were still those of *Chrysomya* (Lee et al. 2004). Recently, Azwandi and Abu (2009) conducted an insect succession study in an oil palm plantation and found dipterans from the families of Sphaeroceridae (*Leptocera* sp.), Piophilidae (*Piophilina* sp.), Psychodidae (*Psychoda* sp.), Sepsidae

(*Nemapoda* sp.), Dolichopodidae, Phoridae (*Megaselia* sp.) and Drosophilidae (*Drosophila* sp.) visited monkey carcasses, which is a new documentation of these families in local forensic entomological studies. Lee et al. (2004) reviewed forensic entomological cases in Malaysia from 1972 to 2002 and found one case infested with Syrphidae (*Eristalis* sp.), which indicated that the corpse was from an environment associated with water, since the larvae of this fly are aquatic in nature. Nazni et al. (2008) also found the larvae of *Piophilina casei* (Piophilidae) infested on human corpses, which indicated a later stage of decomposition. Kumara et al. (2010a) reported two species of Oriental Scuttle fly (Diptera: Phoridae) larvae namely *Megaselia curtineura* (Brues 1909) and *Megaselia spiracularis* Schmitz, 1933 on human cadavers. Kumara et al. (2010b) also reported the pupae of *Desmometopa* sp. (Diptera: Milichiidae) collected from a human corpse found indoor in Penang Island, which is a new record for the country.

Other than Diptera, Heo et al. (2007; 2008a, 2008b, 2009) reported moths, oxyopid spiders, millipedes, grasshoppers, ants, reduvid bugs, staphilinid beetle, yellow

jacket, and bald-face hornet associated with pig carcasses in an oil palm plantation. Lee et al. (2004) found two cases with pubic louse, *Pthirus pubis* (Phtiridae) and one case infested with unidentified larvae of Coleoptera on human cadavers. Kumara et al. (2009) collected the larvae of *Dermestes ater* (Coleoptera: Dermestidae) on a human corpse found in a house in the residential area in Penang, Malaysia.

In this paper, we report four families of Diptera (Micropezidae, Neriidae, Sepsidae and Ulidiidae) and one family of Coleoptera (Hydrophilidae) as insects associated with pig carcasses for the first time in Peninsular Malaysia.

A forensic entomology study using pig carcasses in an oil palm plantation in Tanjung Sepat, Selangor, Malaysia (2.6 °N 101.6 °E) was conducted from August to October 2007 to observe decomposition process and faunal succession. A total of three pig carcasses weighing about 10kg each were used in simulating different manners of death including burnt, hanged and placed on the ground (as control). The first day of placement was counted as Day 1 and the observation was continued until Day 14. Along the decomposition process, we counted and collected some dipterans in the family Micropezidae, *Mimegralla albimana* Doleschall, 1856 (Figure 1); Neriidae, *Telostylinus lineolatus* (Wiedemann, 1830) (Figure 2); Sepsidae, *Allosepsis indica* Wiedemann, 1824 (Figure 3) and Ulidiidae (*Physiphora* sp.) (Figure 4).

Scavenger flies of the genus *Sepsis* spp. are worldwide in distribution. These flies are attracted to carrion, excrement, and other types of decaying matter. They are sometimes mistaken for ants due to their smaller size and narrow “waist” (constricted abdomen). Scavenger flies can



FIGURE 1. Stilt fly, *Mimegralla albimana* (Diptera: Micropezidae) landed on pig carcass

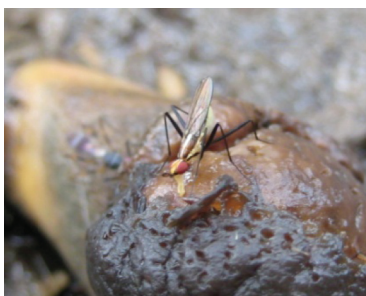


FIGURE 2. Cactus fly, *Telostylinus lineolatus* (Neriidae) was licking on fluid on the bone



FIGURE 3. A group of scavenger fly, *Allosepsis indica* (Diptera: Sepsidae) aggregated on the pig's abdomen



FIGURE 4. *Physiphora* sp. (Diptera: Ulidiidae) with white band on the fore leg

be abundant on carcasses, especially during the advanced stages of decay, as well as on excrement and other types of decaying matter (Greenberg 1971; James 1947; Smith 1975; Smith 1986). In our study, we found the same result where *Allosepsis indica* Wiedemann, 1824 (Diptera: Sepsidae) increased their population gradually from active decay stage (Day 4) to dry stage of decomposition (Day 9) (Table 1). This may be due to their preference for highly decomposed animal carcasses, which released stronger putrid smell. They were also observed to feed on decomposition fluid in a group.

The family of Ulidiidae is also known as Otitidae (pictured-wing flies). This is a large group of small to medium sized flies that usually have their wings marked with black, brown or yellowish colour. Their fore-leg has a white band and the body is often shining and metallic green in color. They are usually found in moist places and are often very abundant, especially in the tropics. Little is known about their larval morphology but some feed on plants materials while others live in decaying matters (Charles & Norman 2004). In Malaysia, Nazni et al. (2007) conducted a distribution study of dipterous flies in Putra Jaya Federal Territory and collected *Chrysomya rufipes* (Diptera: Ulidiidae) (*Chrysomya* = *Physiphora*) from beef-bait placed at the Botanical Garden and Lake area. In the present study, a small number of *Physiphora* sp. was sighted landing on pig carrions and fed on seepage, especially during the fresh, bloated and early decay stage (from Day 1 to Day 4). Therefore, their occurrence on the dead animal carcasses may indicate an early decomposition stage, which may act as clue in forensic investigation.

TABLE 1. The occurrence of Sepsidae, Ulidiidae, Micropezidae, Neriidae and Hydrophilidae according to decomposition stages on the pig carrions in Malaysia

| Species (approximate numbers) | Family | Fresh (day 1-2) | Bloated (day 3-4) | Active decay (Day 4-6) | Advanced-decay (Day 7-8) | Dry and remains (Day 9 onwards) |
|------------------------------------------|---------------------------|--------------------|----------------------|---------------------------|-----------------------------|------------------------------------|
| <i>Allosepsis indica</i> (n~ 500) | Sepsidae | | | + | + | + |
| <i>Physiphora</i> sp. (n~20) | Ulidiidae | + | + | + | | |
| <i>Mimegralla albimana</i> (n~50) | Micropezidae | + | + | + | | + |
| <i>Telostylinus lineolatus</i> (n~50) | Neriidae | + | + | + | | + |
| <i>Sphaeridium</i> sp. (n~100) | Hydrophilidae (beetle) | | | | + | + |

+ Present

n = Total number observed along the decomposition processes

Mimegralla albimana Doleschall, 1856 (Diptera: Micropezidae) was found on the pig carcasses at the early stage and dry stage of decomposition. They usually landed on the bones and licking on fluid using their short sponging proboscis. However, they were rarely seen during active decay and advanced-decay stage of decomposition and did not oviposit on pig carcasses. Micropezid is a small to medium sized elongate flies with very long legs. The adults are usually found in moist places. The group of Micropezidae is abundant in tropic and the larvae live in excrement (Charles & Norman 2004). One study had indicated flies from the family Micropezidae could act as forensic indicator for certain specific habitat (Carvalho et al. 2000).

The Neriidae adults are usually found on certain cactus, flowers, rotting vegetable and the larvae breed in decaying cacti or fruits (Charles & Norman 2004). In our study, *Telostylinus lineolatus* (Wiedemann, 1830) (Diptera: Neriidae) was found on decaying pig carrions and the population increased during early decay stage and the dry stage of decomposition (the same observation as in *M. albimana*). They have a large labellum and licked on fluid which remained on the pig's bones. We also noticed these insects were attracted to decaying fruit such as papaya (*Carica papaya*). However, no neriid larvae were discovered from carcasses.

Several specimens of water beetles, *Sphaeridium* sp. (Hydrophilidae) were collected from the pig carcasses (Figure 5). The occurrence of this beetle on pig carcasses was due to its natural habitat and behavior characteristic. Hydrophilid beetle is a dung feeder, especially on fresh cow dung. They are mostly a water dwelling group but some species is modified to "swim" in the dung or live in a moist habitat (Dillon & Dillon 1961). The condition described here is similar to the environment in the oil palm plantation where a lot of cattle and cows are seen wandering in the plantation and defecate throughout the area. The humidity was high (70-90%) and there is an artificial fresh water pond which served as a water resource for the livestock

within the plantation. These beetles are believed to be a common species in the plantation and used cow dung as their breeding ground and food source. Therefore, the presence of this beetle on pig carcass could be adventitious as their natural habitat is associated with cow dung in the oil palm plantation. However, their occurrence on the dead body may provide information pertaining to the locality of death and types of habitat of the crime scene.



FIGURE 5. Water scavenger beetle, *Sphaeridium* sp. (Hydrophilidae) recovered at the bottom surface of pig carcass

Smith (1986) divided arthropods associated with corpses into four categories: necrophagous, predator, omnivor and adventives. All four Diptera's families mentioned above (Micropezidae, Neriidae, Sepsidae and Ulidiidae) fitted into the adventives group as they came to the carcasses as visitors and feeding on oozing fluid. None of their eggs or larvae were recovered from this study. The hydrophilid beetle, however, which came to the pig carcass during advanced-decay and dry stage of decomposition (from Day 7 onwards) could act as an indicator for later stage of decomposition and types of habitat of the crime scene.

In this paper we highlight the presence of opportunistic insects associated with pig carcasses in Malaysia. Their role in the decomposition process should be well studied and

documented for the advancement of forensic entomology in the tropics.

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to Dr. Rudolf Meire (Department of Biological Sciences, National University of Singapore) and Dr. Dan Bickel (Australian Museum) for their kind assistance in Acalyptrata identification. Sincere thanks are extended to Mr. Lay Ah Kwee for supplying the pigs and accommodation and also Mr. Ahmad Firdaus for laboratory facilities and technical support.

REFERENCES

- Azwandi, A. & Abu, H.A. 2009. A preliminary study on the decomposing and dipterans associated with exposed carcasses in an oil palm plantation in Bandar Baharu, Kedah, Malaysia. *Tropical Biomedicine* 26(1): 1-10.
- Byrd, J.H. & Castner, J.L. 2001. *Forensic Entomology. The Utility of Arthropods in Legal Investigations*. Boca Raton: Florida. CRC Press.
- Carvalho, L.M.L., Thyssen, P.J., Linhares, A.X. & Palhares, F.A.B. 2000. A checklist of arthropods associated with pig carrion and human corpses in Southeastern Brazil. *Memórias do Instituto Oswaldo Cruz* 95(1): 135-138.
- Charles, A.T. & Norman, F.J. 2004. *Borror and DeLong's Introduction to the Study of Insects*. 7th Edition. United State of America. Thomson Brooks/Cole.
- Dillon, E.S. & Dillon, L.S. 1961. *A Manual of Common Beetles of Eastern North America*. Evanston, Illinois. Row, Peterson and Co.
- Greenberg, B. 1971. *Flies and Disease*. Vol. 1. Princeton, New Jersey: Princeton University Press.
- Heo, C.C., Mohamad, A.M., Ahmad, F.M.S., Jeffrey, J. & Omar, B. 2007. A preliminary study of insect succession on a pig carcass in a palm oil plantation in Malaysia. *Tropical Biomedicine* 24(2): 23-27.
- Heo, C.C., Mohamed, A.M., Jeffrey, J. & Omar, B. 2008a. Insect succession on a decomposition piglet carcass placed in a man-made freshwater pond in Malaysia. *Tropical Biomedicine* 25(1): 23-29.
- Heo, C.C., Mohamed, A.M., Jeffrey, J. & Omar, B. 2008b. On the predation of fly, *Chrysomya ruffiacies* (Macquart) by a spider, *Oxyopes* sp. Latreille (Oxyopidae). *Tropical Biomedicine* 25(1): 93-95.
- Heo, C.C., Mohamed, A.M., Rosli, H., Nurul, A.A., Chen, C.D., Jeffrey, J., Kurahashi, H. & Omar, B. 2009. Ants (Hymenoptera: Formicidae) associated with pig carcass in Malaysia. *Tropical Biomedicine* 26(1): 106-109.
- James, M.T. 1947. *The Flies that Cause Myiasis in Man*. Washington, D.C. Miscellaneous publication of the U.S. Department of Agriculture 631.
- Kumara, T.K. & Abu, H.A., Che Salmah, M.R. & Bhupinder, S. 2009. The infestation of *Dermestes ater* (De Geer) on a human corpse in Malaysia. *Tropical Biomedicine* 26(1): 73-79.
- Kumara, T.K., Abu, H.A., Che Salmah, M.R. & Bhupinder, S. 2010b. A report on the pupae of *Desmometopa* sp. (Diptera: Milichiidae) recovered from a human corpse in Malaysia. *Tropical Biomedicine* 27(1): 131-133.
- Kumara, T.K., Disney, H.R.H.L. & Abu, H.A. 2010a. First records of two species of Oriental scuttle flies (Diptera: Phoridae) from forensic cases. *Forensic Science International* (195) e5-e7.
- Lee, H.L., Krishnasamy, M., Abdullah, A.G. & Jeffery, J. 2004. Review of forensically important entomological specimens in the period of 1972-2002. *Tropical Biomedicine* Supplement: 69-75.
- Nazni, W.A., Jeffery, J., Sa'diyah, I., Noorjuliana, W.M., Chen, C.D., Rohayu, S.A., Hafizam, A.H. & Lee, H.L. 2008. First report of maggots of family Piophilidae recovered from human cadavers in Malaysia. *Tropical Biomedicine* 25(2): 173-175.
- Nazni, W.A., Nooraidah, H., Jeffery, J., Azahari, A.H., Mohd. Noor, I., Sadiyah, I. & Lee, H.L. 2007. Distribution and abundance of diurnal and nocturnal dipterous flies in the Federal Territory, Putrajaya. *Tropical Biomedicine* 24(2): 61-66.
- Omar, B., Mohamed, A.M., Sulaiman, S. & Oothuman, P. 1994. Dipteran succession in monkey carrion at a rubber tree plantation in Malaysia. *Tropical Biomedicine* 11(1): 77-82.
- Smith, K.G.V. 1975. The faunal succession of insects and other invertebrate on a dead fox. *Entomological Gazette* 26: 277.
- Smith, K.G.V. 1986. *A Manual of Forensic Entomology*. London: British Natural History Museum.

Heo Chong Chin*
Faculty of Medicine
Universiti Teknologi MARA
40450 Shah Alam, Selangor
Malaysia

Hiromu Kurahashi
International Department of Dipterology
Hikawadai 1-2-21
Higashikurume City
Tokyo 203-0004
Japan

Mohamed Abdullah Marwi
Department of Parasitology and Medical Entomology
Faculty of Medicine
Universiti Kebangsaan Malaysia
50300 Kuala Lumpur
Malaysia

John Jeffery
Department of Parasitology
Faculty of Medicine
University Malaya
50600 Kuala Lumpur
Malaysia

Baharudin Omar
Department of Biomedical Sciences
Faculty of Allied Health Sciences
Universiti Kebangsaan Malaysia
Jalan Raja Muda Abdul Aziz
50300 Kuala Lumpur
Malaysia

*Corresponding author; email: chin@salam.uitm.edu.my

Received: 21 June 2010

Accepted: 21 October 2010