Case Report

Forensically Important Fly Maggots in a Floating Corpse: The First Case Report in Thailand

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The authors report herein the entomological evidence from the first documented forensic floating corpse in Thailand. The male remains of unknown name and age was found in the waterside of a reservoir in Lampang province, northern Thailand. Approximately 13-16 wounds resulting from sharp-edged material were found on the body. Numerous third-instar of blow flies Chrysomya megacephala (F.) and Chrysomya rufifacies Macquart (Diptera: Calliphoridae) were collected, and the entomological evidence of the latter species could be used to estimate ≈ 7days of the postmortem interval. This is the first report of C. megacephala as forensic important fly species in Thailand. Additional research is needed to ascertain the effects of water on the succession and development of both fly species subsequently coming to associate with a corpse so treated in Thailand.

Keywords: *Forensic entomology, Floating corpse, Blow fly, Chrysomya, Thailand*

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Insects associated with corpses have been used as entomological evidence to forensically investigate for not only humans but also animals. Forensic entomology cases have been reported from several death scenes worldwide such as exposed, hanging, buried corpses, with those of submerged and/or floating cases being relatively minimal[1-9]. The authors reported herein the first forensic entomology case in Thailand of a floating corpse.

Case Report

A homicide corpse was found at the edge of a reservoir at Sala subdistrict, Koa-ka district, Lampang province of northern Thailand (north latitude 18 and east longitude 99), on 30 January 2001. The remains were transferred to the Department of Forensic Medicine, Faculty of Medicine, Chiang Mai University, in the following day for forensic investigation. The remains were investigated (#AF01-0076) as a male of unknown name and age, wearing a yellow T-shirt, green trousers and black sneakers. His wrist and ankle were tied and the neck had been gored with a sharp-edged material. Approximately 13-16 wounds, which most likely resulted from the same weapon, were found on his body when investigated. The body was bloated, with greenish-black discoloration in some parts of the body and the odour of decay was very strong, denoting the buoyant/floating stage of decomposition. Numerous fly larvae (maggots), mostly the third-instar, were found particularly at the wounds of the neck and face. Examination of these fly larvae revealed two groups of maggots; nonhairy and hairy (Fig. 1). The morphological features of nonhairy maggots of 8-12 papillae on the anterior spiracle, arrangement of the spines between the prothorax and mesothorax (Fig. 2), and a thick, dark incomplete posterior spiracular peritreme (Fig. 3) displayed the third instar of the blow fly, *C. megacephala*. The maggot bearing large, elongated tubercles along the body segment with their tips bearing numerous small spines (Fig. 4), and the thick incomplete posterior spiracular peritreme were the characters of the third instar of blow fly, *C. rufifacies* (Fig. 5, 6).

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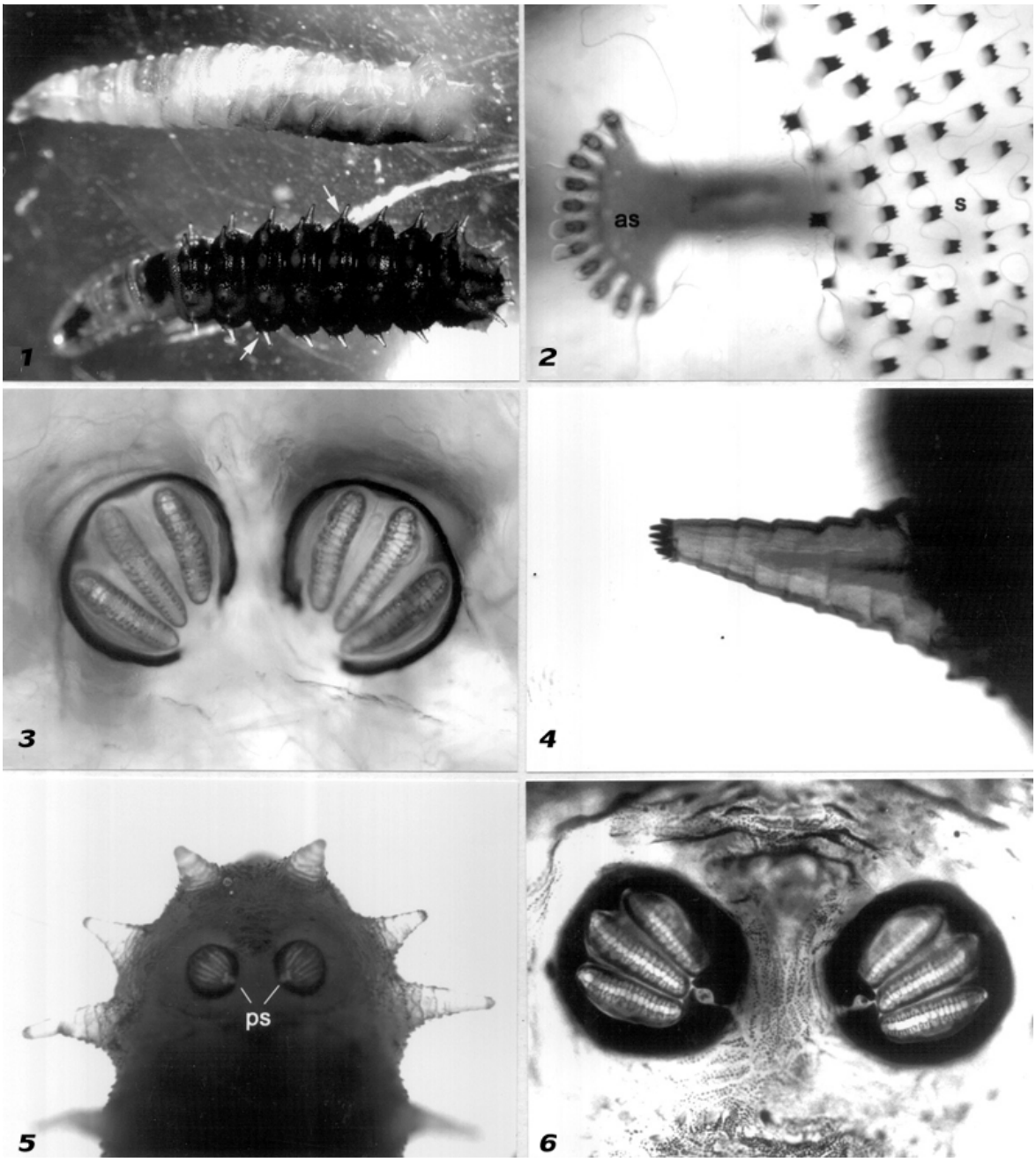

Fig. 1-6 The third-instar of the blow flies, *C. megacephala* and *C. rufifacies*. (1) *C. megacephala* (upper) and *C. rufifacies* (lower), both were ≈ 1.4 cm in length. Arrows indicate large tubercles along the body of *C. rufifacies* (hairy maggot). (2) Anterior spiracle (as) and spine (s) between prothorax and mesothorax of *C. megacephala*. (3) Posterior spiracle of *C. megacephala*. (4) Tubercle along the body of *C. rufifacies*. (5) Last abdominal segment of *C. rufifacies* indicating posterior spiracle (ps). (6) Higher magnification of posterior spiracle of *C. rufifacies*

Using the largest *C. rufifacies* larvae present in this corpse, which was 1.4 cm in length, the postmortem interval (PMI) was calculated by comparing with those *C. rufifacies* larvae reared under ambient air temperature of winter 2001, indicating the age of 5-days-old maggots. However, the egg development rate before hatching was about 1 day, and blow flies came to associate with the corpse when the corpse was

floating, about 1 day after a submerged condition, thus the PMI of this corpse is consistent with about 7 days.

Discussion

The blow fly larvae collected from this corpse were identified morphologically as *C. megacephala* and *C. rufifacies*, the hairy maggot, while the rearing to adult-hood of both species was confirmed. The former species was reported as the most predominant blow fly species in Thailand both in urban and mountainous areas, while the latter species had much lower abundance[10-12]. In Thailand, larvae of both species have been found associated in the decompositional stage of a corpse ranged from the fresh up to the black putrefaction stage, occupied with different death scenes such as the exposed, burned and hanging corpses[13].

To estimate PMI, the developmental rate of the known insect species under the temperature similar to those collected from a corpse and/or death scene should be accessible. So far, only the larval *C. rufifacies* development rate was at hand during the natural temperature in the year 2000-2001 of Chiang Mai, the most adjacent province of Lampang (unpublished data). It is shown that the development rate of *C. rufifacies* larvae within the same season in Thailand (i.e., summer, rainy and winter) is not much changed, but differed significantly among seasons no longer than 2-3 days. As for the largest *C. rufifacies* larvae present in this corpse (1.4 cm) associated with the ambient air temperature during January 2001, the age of these larvae is 6 days including egg development. Although the PMI estimation in this case based on the development rate of the exposed air environment, the temperatures of water and air in northern Thailand particularly in the lowest point before sunrise are so close (less than 1 C). During the daytime, the water temperature slightly increases, but the increment was not much between the seasons in Thailand.

For a submerged or floating corpse, blow fly maggots may be either present or absent[4]. In this particular case, blow flies came to associate with the corpse while floating, ~1 day after a submerged condition, is the most likely. Female flies can oviposit in a corpse in areas of natural orifices and/or wounds, if such flies are present in that indigenous fauna. While floating, the corpse may not be totally submerged in the water, but exposed above the water line. Female blow flies could access to corpse easily since there were a lot of wounds in this case resulting from sharp-edged material. According to the study of the intertidal carcass near the sea[14], most of the carcasses were continually exposed above the water line, making the oviposition of these blow fly species occur and later, the accomplishment of maggot colonization. This is most likely the same explanation of the presented case since the water fluctuation within the reservoir was minimal.

The presented case has obviously shown that *C. megacephala* and *C. rufifacies* were fly species associated with a corpse found in the waterside habitat in northern Thailand, particularly in the early stage of decomposition of a corpse. This agrees with previous reports of forensic cases and/or carcasses worldwide, both in terrestrial and intertidal sites[6,9,14,15]. Although adult flies were equally attracted to both terrestrial and intertidal carcasses[14], colonization in the latter condition was limited by water in the study in Hawaii, USA, and the presented subject is, therefore, merit for further investigation in Thailand. The larval development rate of only *C. rufifacies* has already been established, not for *C. megacephala*; and this merits investigation.

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References

1. Anderson GS. The use of insects to determine time of decapitation: A case-study from British Columbia. J Forensic Sci 1997; 42: 947-50.
2. Anderson GS. Wildlife forensic entomology: determining time of death in two illegally killed black bear cubs. J Forensic Sci 1999; 44: 856-9.
3. Benecke M. Six forensic entomology cases: Description and commentary. J Forensic Sci 1998; 43: 797-805.
4. Benecke M. A brief history of forensic entomology. Forensic Sci Int 2001; 120: 2-14.
5. Goff ML. A fly for the prosecution: How insect evidence helps solve crimes. Cambridge (MA): Harvard University Press, 2000.
6. Goff ML, Flynn MM. Determination of postmortem interval by arthropod succession: a case study from the Hawaiian Island. J Forensic Sci 1991; 36: 607-14.
7. Greenberg B, Wells JD. Forensic use of *Megaselia abdita* and *M. scalaris* (Phoridae: Diptera): Case studies, development rates, and egg structure. J Med Entomol 1998; 35: 205-9.
8. Lord WD. Case histories of the use of insects in investigations. In: Catts EP, Haskell NH, editors.

Entomology & death: A procedural guide. Clemson (SC): Joyce's Print Shop, 1990: 9-37.
9. Smith KGV. A manual of forensic entomology. Ithaca NY: Cornell University Press, 1986.
10. Sucharit S, Tumrasvin W, Vutikes S. A survey on house flies in Bangkok and neighboring provinces. Southeast Asian J Trop Med Public Health 1976; 7: 85-90.
11. Tumrasvin W, Sucharit S, Kano R. Studies on medically important flies in Thailand. IV. Altitudinal distribution of flies belonging to Muscidae and Calliphoridae in Doi Indhanondh Mountain, Chiang Mai, in early summer season. Bull Tokyo Med Dent Univ 1978; 25: 77-81.
12. Sucharit S, Tumrasvin W. The survey of flies of medical and veterinary importance in Thailand. Jpn J Sanit Zool 1981; 32: 281-5.
13. Sukontason K, Sukontason K, Narongchai P, Lertthamnongtham S, Piangjai S, Olson JK. *Chrysomya rufifacies* (Macquart) as a forensically-important fly species in Thailand: A case report. J Vector Ecol 2001; 26: 162-4.
14. Davis JB, Goff ML. Decomposition patterns in terrestrial and intertidal habitats on Oahu Island and Coconut Island, Hawaii. J Forensic Sci 2000; 45: 836-42.
15. Lee HL. Recovery of forensically important entomological specimens from human cadavers in Malaysia - an update. Malays J Pathol 1989; 11: 33-6.

ตัวหนอนแมลงวันที่มีความสำคัญทางนิติเวชศาสตร์ในศพลอยน้ำ: รายงานแรกในประเทศไทย

กาบแก้ว สุคนธสรรพ์, ไพฑูรย์ ณรงค์ชัย, คม สุคนธสรรพ์, รุ่งกานต์ เมธานิติกร, สมศักดิ์ เปียงใจ

รายงานนี้บันทึกหลักฐานทางกีฏวิทยาจากศพลอยน้ำเป็นครั้งแรกในประเทศไทย ศพชายไทยไม่ทราบชื่อและอายุถูกพบริมอ่างเก็บน้ำในจังหวัดลำปาง ตามลำตัวมีร่องรอยบาดแผลจากการถูกของมีคมแทงประมาณ 13-16 แผล ที่ลำตัวศพพบตัวอ่อนระยะที่ 3 ของแมลงวันหัวเขียวสองชนิดคือ Chrysomya megacephala (F.) และ Chrysomya rufifacies Macquart เป็นจำนวนมาก จากการเปรียบเทียบขนาดลำตัวหนอนที่มีอายุมากที่สุดกับข้อมูลอัตราการเจริญเติบโตของ C. rufifacies ในห้องปฏิบัติการที่มีอุณหภูมิใกล้เคียงกับสถานที่พบศพ ทำให้สามารถประมาณระยะเวลาหลังการตายของศพว่าประมาณ 7 วัน รายงานนี้นับเป็นรายงานแรกที่พบตัวหนอนแมลงวันหัวเขียว C. megacephala ในศพที่พบในประเทศไทย อย่างไรก็ตามควรมีการศึกษาวิจัยต่อไปเกี่ยวกับอิทธิพลของน้ำต่ออัตราการเจริญเติบโตของหนอนแมลงวันหัวเขียวที่มักพบในศพในประเทศไทย