

# Research on major necrophagous flies in Zhengzhou district between Spring and Summer<sup>☆</sup>

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## Abstract

**Objective.** To study the major species of necrophagous flies and their regular activity on carcass in zhengzhou district. **Methods.** Forty dead rats were placed outdoors at different time from March to September in Zhengzhou district. Some species of necrophagous flies that appeared on the cadavers were observed and identified. **Results.** There were 8 main species who belonged to 3 families, including *Domestica vicina*, *Muscina stabulans*, *Ophyra capensis*, *Aldrichina grahami*, *Lucillia sericata*, *Lucillia cuprina*, *Chrysomya megacephala*, and *Bottcherisca peregrina*. Besides, it showed obvious regularity that different species of necrophagous flies appeared on cadavers at different postmortem interval and on different part of cadavers. **Conclusion.** It may be useful for estimating post mortem interval (PMI) in Zhengzhou district. [Life Science Journal. 2008; 5(3): 31 – 34] (ISSN: 1097 – 8135).

**Keywords:** Zhengzhou district; post mortem interval; necrophagous flies

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## 1 Introduction

It has been confirmed by experts and scholars at home and abroad that it has successive regularity that necrophagous flies invade the cadavers, which is the basic rationale of forensic entomology<sup>[1-2]</sup>. Relative precise inference to post mortem interval (PMI) can be deduced according to the derivative rules of appearance and the developmental rules of necrophagous flies on the surface of cadavers<sup>[3-4]</sup>. Thus, it is necessary to investigate the succession regularity of necrophagous flies at different areas to fulfill the forensic demands because different areas has different species of necrophagous flies according to the research at home and abroad. Therefore, some scholars studied the species of necrophagous flies and their rules in Beijing, Hangzhou, Haerbin, Chengdu, Huhehaote and so on<sup>[5-7]</sup>. But there were few about the flies of Henan province, not to say necrophagous flies. This study aimed at investigating the successive regularity of necrophagous flies and their emergence time from March to September.

## 2 Materials and Methods

### 2.1 Sampling sites

One was in the urban of Zhengzhou city, around the medical college of Zhengzhou University. And the other was the suburban of Zhengzhou city, on the meadows of new campus of Zhengzhou University.

### 2.2 Materials

Forty rats, average weight 250 g, were provided by Experimental Animal Center of Medical College of Zhengzhou University.

### 2.3 Methods

Forty rats were separated into two groups. One of which was killed by neck break and the other group was killed by paunching. From March to September, the flies appearing on the cadavers of rats were frequently observed, recorded and collected 3 – 5 times by a home-made net. Part of the flies were fixed with pins on plastic foams, labelled the time and site of collection, and frozen for store.

When the maggots came out on the cadavers of the rats, the larvae were gathered. Hatched the larvae in lab under temperature and humidity similar to the natural conditions in order to observe developmental period of differ-

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ent flies. Larvae and pupa, were labelled the time and sites of collection, and killed and stored in the 75% alcohol.

## 2.4 Entomologic identification of specimen

The gathered flies, maggots and pupa were classified by experts according to morphology.

## 3 Results

### 3.1 Difference of fly species and appearance season on the cadavers

From March to September, there were three families, 8 strains of diptera necrophagous flies appearing on the cadavers in Zhengzhou district, which were *Domestica vicina*, *Ophyra capensis*, *Lucillia sericata*, *Chrysomya megacephala*, *Lucillia cuprina*, *Aldrichina grahami*, and *Bottcherisca peregrina* (Table 1).

From March to April, the species and amount of flies on cadavers were relatively few, including dominantly *Aldrichina grahami*, *Domestica vicina*, and Flesh flies. From May to June, the species and amount of flies increased on the cadavers, mainly *Lucillia sericata*, *Lucillia cuprina*, *Domestica vicina*, *Muscina stabulans*, *Ophyra capensis*, and *Bottcherisca peregrina*. Some other flies scattered on cadavers. From May to June, the species and amount of flies increased on the cadavers, mainly *Chrysomya megacephala*<sup>[8]</sup>, *Lucillia sericata*, *Lucillia cuprina*, *Domestica vicina*, *Ophyra capensis*, and *Bottcherisca peregrina*.

### 3.2 Difference of arrival interval of necrophagus flies on cadavers by different executed methods

Necrophagous flies appeared on the cadavers which were killed by pauching to bleed in 5 – 30 minutes, however when they appeared on the integrated cadaver period was prolonged 15 – 30 minutes. Besides, the arrival interval of necrophagus flies was influenced by temperature, rainfall, wind and so on<sup>[9]</sup>.

### 3.3 Egg-laying interval or emergence time and regularity of larvae

Between March and April, *Aldrichina grahami* at first arrived on the surface of cadavers, laying eggs after 2 – 3 hours on the wounds and the humid fur around the wounds and on the mouths, noses, anuses and so on<sup>[10]</sup>. Between May and June, *Lucillia sericata* laid eggs on the cadavers 0.5 – 1 hours after arriving on the cadaves. Between July and August, *Chrysomya megacephala* laid eggs on the cadavers 0.5 – 2 hours after arriving on the cadavers. Flesh flies and Domestic flies occasionally firstly appeared on the cadavers but the amount were few, scattered among the dominant species. Besides, the maximal maggots

**Table 1.** Necrophagous flies appearing on the cadavers in Zhengzhou district

Family	Species
Muscidae	<i>Domestica vicina</i>
	<i>Muscina stabulans</i>
Calliphoridae	<i>Ophyra capensis</i>
	<i>Aldrichina grahami</i>
	<i>Lucillia sericata</i> <i>Lucillia cuprina</i>
Sarcophagidae	<i>Chrysomya megacephal</i> <i>Bottcherisca peregrina</i>

gathered from the cadavers were not hatched to be Flesh flies and Domestic flies, which demonstrated the laying-egg intervals of Flesh flies and Domestic flies was later than that of dominant species. 1 – 1.5 mm larvae and hatched maggots appeared 12 – 15 hours after killing the rats, which concentrated on masked sites by skid and fur. The number of larvae increased to the maximum 2 – 3 days after death.

### 3.4 Developmental period of necrophagus flies

The developmental period of necrophagus flies were significantly influenced by the temperature and humidity. If the humidity was less than 35% and the temperature was higher than 30 °C, the maggots could not be eclosed and the mortality rate was very high (Table 2).

## 4 Discussion

The experiment verified that flies appeared from March to September in Zhengzhou area, mainly including *Domestica vicina*, *Muscina stabulans*, *Ophyra capensis*, *Aldrichina grahami*, *Lucillia sericata*, *Lucillia cuprina*, *Chrysomya megacephala*, and *Bottcherisca peregrina*. Flies appeared from 9 – 10 A.M. to 5 – 6 P.M. every day. The species and amount of flies on cadavers is in the early morning and evening fewer than at noon, and reached most from 11 A.M. to 2 P.M.. Therefore, when the weather was gale or rainy, the amount of necrophagus flies decreased significantly, even invisibly. *Aldrichina grahami* were dominant in March and April, *Lucillia sericata* and *Lucillia cuprina* in May and June, *Chrysomya megacephala* in July and August. The results demonstrated that necrophagus flies on cadavers in Zhengzhou district had their specific constitutes and significant territory characteristic, and their succession regularity were in line with that of

**Table 2.** The developmental period of four first laying-eggs dominant species under natural temperature

Species	Period of eggs (d)	Period of larvae (d)	Period of maggots (d)	Developmental period (d)	Average temperature (°C)	Relative humidity(%)
<i>Aldrichina grahami</i>	0.8 ± 0.1	7.2 ± 0.2	9.9 ± 0.5	17.6 ± 0.4	18	41 – 53
<i>Lucillia sericata</i>	0.7 ± 0.1	6.3 ± 0.1	9.1 ± 0.2	16.1 ± 0.3	23	50 – 60
<i>Lucillia cuprina</i>	0.7 ± 0.1	6.4 ± 0.1	9.2 ± 0.1	16.2 ± 0.3	23	50 – 60
<i>Chrysomya megacephala</i>	0.6 ± 0.05	6.0 ± 0.1	8.7 ± 0.1	14.5 ± 0.1	32	68 – 81

the insect fauna and has relative steady regularity, which is similar to the results that different areas has different species abroad<sup>[11]</sup>. Thus, this result can be used to deduce PMI, death site by the derivative rule of necrophagus on the cadavers in Zhengzhou district.

The results showed that the arrival interval of necrophagus flies invading the cadavers was mainly influenced by temperature. In addition, the sequence that flies arrived on the cadavers was irregular in the aspects of species in different seasons. The maximal maggots gathered from the cadavers by outside artificial incubation demonstrated different months had different dominant species which were the earliest and the most on the cadavers, lasting 2 – 3 days. *Aldrichina grahami* were dominant in March and April, *Lucillia sericata* and *Lucillia cuprina* in May and June, and *Chrysomya megacephala* in July and August, as has significant regularity. Thus, when we deduced the PMI, these factors should be fully considered. When the organism died, necrophagus flies continuously arrived on the surface of cadavers and laid eggs to hatch, the developmental periods of different and same species of flies may be overlapped, so it is necessary to deduce the PMI by the first laying-eggs flies' succession and developmental period<sup>[12]</sup>.

This experiment showed that flies at first concentrated on the natural pores such as mouths, eyes, ears, noses, anuls and around the wounds which coincided with the previous reports<sup>[9]</sup>. Flies laid eggs several minutes to several hours under the sunny, warm, windless condition. If the weather was not good, the laying-egg time would be prolonged<sup>[6]</sup>. The difference of the laying-eggs times of different seasonal dominant species was 1 – 2 hours. Egges were lumped on the humid site such as the natural pores and around the wounds<sup>[7]</sup>. The maggotss conglomerated in the frill, crevice and masked site beneath the cadavers, which could be used to judge the wounds. On the cadavers in the luxuriant grass outskirts, *Ophyra capensis* was dominant. However, on the cadavers in town, *Aldrichina grahami* was dominant, which demonstrated that necrophagus flies were influenced by enviromental factors and which could be used to deduce whether the cadavers were moved or not.

At the same time, the experiment showed that climatic conditions was the key factors to affect the derivative rules of necrophagus flies on cadavers outdoor. In deducing the time of death, the impact of weather conditions must be considered, which included temperature, humidity, wind, rain, light intensity and other factors<sup>[13]</sup>. Temperature and humidity from the beginning to end affected the whole developmental periods of flies and determined the length of developmental period. In addition, with the temperature upgrading, the interval of flies invading the cadavers and laying-eggs was shortened. The species of necrophagus flies in summer were more than those in spring<sup>[14]</sup>. The interval of flies invading the cadavers and laying-eggs were prolonged and the amount of necrophagus flies decreased significantly and even invisibly. The interval of flies invading the cadavers and laying-eggs in the shade had contrasted with that under the sunny condition<sup>[15]</sup>. For example, *Aldrichina grahami* and *Lucillia sericata* rarely appeared and laid eggs under sunny and the hatching-eggs period in the shade was longer several hours than that under the sunny side. Necrophagus flies had regular activities that they went out in the daytime, and came back in the evening, and they did not act or lay eggs without lights or at night<sup>[16]</sup>. The interval arriving the cadavers and laying eggs of flies had seasonal rules because of temperature. Pupal anaphase development was affected by humigity. The arid environmental condition could make pupa not to eclose and the mortality rate was more than 85%.

This experiment initially summarized the species and derivative rules of necrophagus flies on cadavers in spring and summer. More detailed and comprehensive work depends on further study.

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