Insects’ colonization of human corpses in warm and cold season

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Abstract

The succession of insects is commonly used for estimation of the postmortem interval (PMI). In the warm season there are many insect species, which enable us to estimate the time of death, but in the cold season there are less species. For the estimation of a seasonal pattern, we examined 117 human corpses found in domestic environment during the year 2001. We found three typical ‘summer species’, active from May until October, three further species active from April until November. One blowfly species (Calliphora vicina) and the family of scuttle flies were active all over the year. These insects may be useful for PMI estimation in winter; however, further research concerning the developmental rate of scuttle flies is required. The distinct seasonal pattern of the early colonizing blowfly species allows to allocate the time of death to a particular time interval even in cases of long PMIs if empty puparia of these insects are found.

Keywords: Postmortem interval; Insects’ colonization; Seasonal differences

1. Introduction

In forensic entomology, necrophagous insects are useful to answer questions concerning estimation of the postmortem interval (PMI) [1–6], postmortanal transfer [7], toxicological investigation [8–11] and neglect of living people [12,13]. The use of insects in death scene investigations dates back to the 13th century in China [14] and came into use in Europe in the 19th century. Since the early 1980s, forensic entomology became more and more popular.

There are many species usable to calculate the time of death especially in the warm season, but it is commonly known that less insect species are active during the cold season. The following study presents seasonal differences concerning the occurrence of necrophagous species in domestic environment.

2. Materials and methods

During the period of one calendar year (2001) all species of necrophagous insects colonizing 117 human corpses found in domestic environment were classified. Fly larvae were collected, reared in the laboratory and identified as adult flies [15–17].

In total 24 species were found, most of them determined to the species level, some to the genus and two to the family. For the present study, only species frequently occurring (at least in 15 cases) were evaluated. Thus, the seasonal pattern of six fly species, one fly family (scuttle flies = Phoridae), and beetles, genus Dermestes (combination of the two species Dermestes maculatus and Dermestes lardarius) was investigated.

3. Results

As expected, more different species were found in summer than in winter (Fig. 1). During the warm season,
three to four species per case on the average and a maximum of seven species were detected. In winter, one to two species could be discovered (Fig. 1). The determined species were allocated to ‘summer species’ (Lucilia sericata, Phormia regina and Sarcophaga sp.), which were only found in the warm season from May to October (Fig. 2, Table 1). Calliphora vomitoria, Muscina stabulans and the larder beetles (Dermestes sp.) were additionally active in early spring (April) and late autumn (November), but not during the winter months (Fig. 3, Table 1). Only one blow fly species (Calliphora vicina) and the scuttle flies (Phoridae) could be found over the whole year (Fig. 4, Table 1), the latter ones were more frequent in December, January and February than in the warmer season. All of the eight most frequent species were found in summer.

### 4. Discussion

In comparison with the colonization of corpses found in the open, nature the number of species in domestic environment appears low. There are usually less species found in human houses than outside [18–20].

*L. sericata* was the most frequent species in summer, but was not detected from November to April. It is a ‘warm-adapted’ blowfly species, which could be found most often at bright sunlight and high temperatures. *M. stabulans* and *C. vomitoria* were additionally present in spring and autumn, when they were active with a higher frequency than in the hot summer months. The colonization of various blowfly species during the warmer season leads to a more precise PMI estimation than it might be the case

<table>
<thead>
<tr>
<th>Lucilia sericata</th>
<th>Phormia regina</th>
<th>Sarcophaga sp.</th>
<th>Calliphora vomitoria</th>
<th>Muscina stabulans</th>
<th>Dermestes sp.</th>
<th>Calliphora vicina</th>
<th>Phoridae</th>
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<td>42</td>
<td>16.5</td>
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<td>75</td>
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Fig. 1. Distribution of 24 species found in 117 cases over the year 2001.

Fig. 2. Percentage of cases of species active from May until October in 2001.
in winter. In the cold months only one blowfly species, *C. vicina*, and the family of scuttle flies were found, the latter ones apparently preferring the cold season. These insects may be useful for PMI estimation in winter; however, the developmental rate of scuttle flies is not well known yet [21] and further research in this field is required. Due to the distinct seasonal pattern of the early colonizing blowfly species it becomes possible to determine the time of death even in cases of long PMIs (i.e. several months or years) if empty puparia of these insects are found.

**References**


