The importance of collecting live fly larvae from a severely decomposed human cadaver in winter. Case report

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Abstract: A severely decomposed cadaver was found in a snow-covered mountain forest on January 31, 2010. The cadaver, later identified as a 24-year-old Japanese man, was hanging from under a tree and consisted mainly of skeletal remains. At autopsy, dozens of larvae were observed around the inner cavity of the knee joint, and entomologically they were identified as the third instar larvae of the family Piophilidae (Diptera). It is interesting that the larvae were found alive at the autopsy in January when snow is present. The entomological information supports the information that the man had died around September 8 with the following reason: the location where the victim was found was too cold for the flies to have deposited their eggs; at the man’s death, the ambient temperature was enough high for flies to deposit their eggs; according to the gradual decrease of the ambient temperature, the larvae penetrated into deep lesion with feeding. This is a valuable case demonstrating that live larvae can be obtained from a severely decomposed cadaver found in winter and can support the information about the time of death. This report also validated the importance of collecting Piophilidae flies of severely decomposed cadavers in winter.

Key Words: fly larvae, winter, severely decomposed cadaver, forensic entomology, postmortem interval, autopsy.

Entomological information can often be useful in determining both the manner of death (insect activity can sometimes be concentrated around wound sites) and the post mortem interval (PMI) when medical parameters are no longer of value [1-3]. Collecting insect larvae, and rearing them to adults for species and instar identification, can provide useful entomological evidence [4].

For cadavers with short PMI, detailed information about the species and instars of collected larvae may provide entomological evidence for PMI estimation. Even if the cadavers had been restored for the long time, flies are often observed and provide useful information [5].

We report a case in which a victim was found in a snow-covered forest. Although the cadaver consisted mostly of skeletal remains due to postmortem changes, live fly larvae could be collected. As this entomological evidence was well accordance with the information obtained from police investigation, we suggest the importance of collecting live insects even in the severely decomposed cadavers in winter.

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Case report

A body was found in a mountain forest in the northern part of Tochigi Prefecture (lat. 36.96°N; long. 139.70°E), Japan, on 31st of January, 2010 (Fig. 1). As the season was winter, the forest was covered with snow. The victim, found hanging from under a tree, was later identified through dental analyses and his belongings as a 24-year-old Japanese man. Reportedly, he had been worried about his relationship with his girlfriend. He was last seen by his friend on the morning of September 8, 2009, and was reported to the police as missing on September 12 by his family. The police investigation revealed that the victim’s vehicle was captured by a road-side camera near the location where he was found on 1 pm, September 8. Later, his vehicle was found at the parking area located in the forest.

The climatological data obtained from the government weather station located a short distance from where the body was found is shown in Fig. 2. The mean temperature from the time of the man’s disappearance to the body’s discovery had ranged from -5.8–16.3°C with a daytime maximum temperature of -3.3–24.9°C and a daytime minimum temperature of -11.1–15.3°C.

Autopsy findings

An autopsy performed the day after the body was found revealed that most of the body (the head, face, chest and upper extremities) consisted of skeletal remains. The lumbar region and lower extremities were mummified, which caused them to be dry and leathery with no moist putrefaction. The skin and underlying tissues were hard. No marked injuries were found on the cadaver except for post-mortem changes. When the skin and soft tissues of the lower extremities were cut to examine the injuries, dozens of larvae were observed around the inner cavity of the knee joint (Fig. 3).

Entomological examination

From discovery until autopsy, the body was stored in the morgue at the temperature of 5.0°C. At autopsy, some larvae were collected from the cadaver, treated in 70°C ethanol and preserved in 70% of ethanol. Following rearing to adults, the larvae were identified as the third instar larvae of the family Piophilidae (Diptera).

Discussion

Because insects use decomposing cadaver tissues both as a source of food and as a place to rear their young, they can be used to determine the postmortem interval in concert with information of species, instar, growth rate and ambient temperature [1-3, 6]. For this reason, forensic entomology, which identifies the species and stages of insects, has become increasingly important for criminal investigation [4, 7]. Sarcophagid, calliphorid and muscid
flies, which are the first insects to colonize decomposing remains, usually arrive from minutes to hours after death and begin to lay eggs or larvae. Therefore, larvae are helpful for estimating PMI in relative short duration after death [1-3]. In this case, the victim was found in January when snow is often present. It is interesting that the larvae were alive at the autopsy. According to the police investigation, the man had died around September 8. The climatological data indicated that the maximum ambient temperature was over 10°C around September and October, enough condition that the flies deposit eggs.

The Piophilid flies shown in this case are commonly found in a variety of protein rich animal matter, and their presence has been typically associated with advanced stages of cadavers [8]. Furthermore, it has been assumed that larvae do not develop in a cadaver until 3–6 months postmortem, when fatty acids and caseic products are present [9]. There have been some reports of Piophilidae larvae found in forensic cases [10-12]. In this case, as the postmortem duration longer, the ambient temperature gradually decreased. Subsequently, around January 31 when the cadaver was discovered, the maximum ambient temperature was 6.6°C and minimum temperature was -3.7°C. To avoid the low ambient temperature the larvae penetrated into the deep lesion of the cadaver, crawled into the inner space of the knee joint to avoid the cold conditions and to seek soft tissue for feeding. Generally, at the temperature varying from 0 to 10°C, as the deceleration of metabolic activity of larvae, development mainly stops like under anesthetic condition. However, because the larval aggregation supports the information that the man had died around September 8. To develop live larvae at the autopsy lead to the following considerations: the location where the victim was found was too cold for the flies to have deposited their eggs; at the man's death, the ambient temperature was enough high for flies to deposit their eggs; according to the gradual decrease of the ambient temperature, the larvae penetrated into deep lesion with feeding.

In the field of forensic entomology, sarcosaprophagous families of Diptera such as Calliphoridae or Sarcophagidae are useful for determining PMI in the early phase of decomposition. In this case, Piophilidae also provides valuable information about cadavers in advanced stages of decomposition in winter. This case is valuable in that live larvae could be found from a severely decomposed human cadaver in winter. The entomological information can support the information obtained by the police. This report validated the importance of collecting Piophilidae flies of severely decomposed cadavers in winter.

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References