

The study of forensic entomology biology essay



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The study of insects that inhabit decomposing human remains as it relates to the medicolegal investigation of death is commonly known as forensic entomology. (Byers) The diversity of the field, a general overview of common insect life cycles and habits, and the data collection methods of insects, weather information, and scene observations will all be covered. The interpretation and application of entomological data recovered from the death scene will aid the Medical Examiner in establishing an estimated time since death or postmortem interval.

Forensic entomology is subdivided into: medicolegal, urban, and stored product pests. “ The urban aspect involves insect infestation in homes, gardens, or other buildings that cause civil disputes among neighbors. The stored product pests’ division typically involves insect infestations that are founding food contamination cases. The medicolegal branch deals with the feeding insects that infest humans (dead or alive). Insect infestations on living humans may indicate neglect or abuse.” (Byrd) For the context of this paper the focus will be on the medicolegal branch of forensic entomology.

Insect habits and life cycles play a significant role in forensic entomology. Knowledge of the insects that inhabit the human body postmortem is very important. Understanding the succession of blowflies, beetles, and other insects is crucial in establishing the postmortem interval. “ The blowfly is the most common fly found all over the world even though it favors warm moist climates. The life cycle of the blowfly has been well observed and documented making this a great staple in forensic entomology.”(Byers) Adult blowflies begin feeding and laying eggs on a body within minutes of death. (Chang) “ The eggs hatch into first instar (larva stage) between 6 and 48

hours depending on the temperature and begin feeding immediately. Each of the three instar phases is followed by a moulting (skin shedding) event in which the larva grow and gain another larger mouth opening and hook for feeding. The three instar phases can take anywhere from 3 to 10 days to complete. These stages remain fairly constant depending on the temperature. After the third moult the larva is done growing and migrates away from the body to the ground to pupate. Pupating can take 14 days or longer depending on the temperature. Once the adult fly emerges a few hours are needed to dry its wings before the process starts over again. Adult flies can live around 30 days. This cycle is typical of most species of flies only variable being the timing of stages.”(Byers) Beetles inhabit the body within two days of death. Some beetles consume flesh but most devour fly eggs and larvae. Rove beetles develop extremely fast.(Chang) “ These beetles inhabit early to feed on fly larvae and to lay eggs of their own inside the corpse. The emerging beetle larvae also prey on fly larvae. Some species of beetles have extended egg development periods and their larvae can be found in later stages of decomposition. Beetle larvae differ from fly larvae by the presence of 3 pair of legs that fly maggots’ lack.”(Byrd) Dermestid beetles come during the final stages of decomposition to feed on the dried tendons and bones of the remains.(Chang) These are the only beetles that possess enzymes that break down the keratin protein components of hair. Wasps, ants, and bees come to the body to feed on the insects that are feeding on the cadaver. The problem is that they may consume vital information for establishing a postmortem interval. Moths are usually the last to arrive consuming any leftover hair.

The collection of circumstantial information is very important. " Notes should be taken upon arrival at the scene. The proximity of the body to vegetation, general habitat, sunlight conditions, distance from open windows and doors (if found inside), localization of insects on the body, insect stages present, and any apparent scavenging from other animals should be thoroughly noted. The ground surface temperature, maggot mass temperature, temperature of air (from approximately chest height in the shade), temperature between the body and ground, and after the body is removed the temperature of the soil directly underneath the body should also be noted. Lastly, the maximum and minimum daily temperatures and rainfall for approximately two weeks before the person went missing to five days after recovery should be retrieved from a local weather station."(Byrd)

After notes are taken insect collection begins. Due to their ability to flee the scene adult flies and beetles should be collected first and placed in " killing jars" (jar of cotton balls soaked in ethyl acetate) to immobilize them. " Once immobilized, specimens should be placed in a solution of 75% ethyl alcohol for preservation. Samples of eggs, largest larvae seen, and up to 100 larvae should be collected for preservation and live observation. Pupa casings are usually overlooked but should also be collected. They have a strong relevance to entomologist. Along with the insects, soil samples are collected for further testing. Immediately after each sample is collected the vial should be labeled with all of the following information: geographical location, case number, date and hour of collection, location on body recovered from, and the person who collected the specimen."(Byrd)

The knowledge from forensic entomology can assist the Medical Examiner with estimating the postmortem interval or time since death by giving an estimated “time since colonization”. “The process can be challenging you account for all the factors that play a role in insect maturation, activity, and succession. Analyzing insect maturation correctly can give you an approximate postmortem interval within 5 to 6 hours of death.” (Gannon) “A fly life cycle can span between 9 and 35 days depending on the species. Identifying larvae of a known species during a particular instar phase in conjunction with weather conditions can produce a fairly accurate postmortem interval. Succession is used to establish a wider postmortem interval than when using maturation. Flies arrive almost immediately to feed and lay eggs on the body followed by beetles to feed on fly larvae days to weeks later. As time passes beetles will outnumber flies as soft tissue supplies diminish. Some case studies have documented the importance of the fly to beetle ratio. “If only flies are present the postmortem interval is less than 3 days. When flies largely outnumber beetles the postmortem interval is between 3 and 13 days. When beetles and flies are almost equal the postmortem interval is 13 to 25 days. If beetles largely outnumber flies or are the only insect present studies show the postmortem interval is over 25 days. One problem with using insect succession to establish postmortem interval is that it can only be determined between a few days up to one year.”(Byers) Some insects are only active during specific seasons throughout the year, so the presence of an insect (dead or alive) can narrow down the postmortem interval to a specific season.” (Byers) Other major issues with using succession to estimate the postmortem interval is the reoccurrence of the same insects during later phases of decomposition,

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varying temperatures throw off balance the timings of life cycles, and the poor documentation of beetle life cycles.(Weiss)

Forensic entomology can also reveal other circumstances surrounding the death. " Postmortem body movement can be determined if the insects recovered from the body are not indigenous to the region the body is located. The absence of insects can reveal that the body may have been frozen which would not make it a desirable place for egg laying, or that the body may have tightly sealed or buried deep underground making it inaccessible to insects. An unusual succession of insects to the body may also indicate freezing or wrapping of the body. Antemortem and postmortem circumstances of the crime may present themselves by the recovery of insect species that usually only attract to fecal and urine soaked clothing, which can indicate abuse, rape or some type of incapacitation. If these conditions were not present the insects would be absent. "(Byrd)

Skeletonization of remains can happen quickly due to insect activity causing valuable body tissues and fluids needed for toxicological analysis to be lost. " In spite of the loss of human tissues, toxicological analysis of the insect larvae that have fed on the body can be successful due to the larval tissues acquiring the toxins and drugs that were stored in the human body tissues before death."(Byrd)

Forensic entomology is a diverse field that can be used in many avenues of death investigation. A general knowledge of common insects found inhabiting decomposing remains is important in helping to establish an estimated postmortem interval. In order to come to any conclusion on postmortem intervals the data collected from the insects, weather, and <https://assignbuster.com/the-study-of-forensic-entomology-biology-essay/>

environment have to be analyzed collectively. Forensic entomology also aids legal personnel in evaluating special circumstances involving a death in question. Even though forensic entomology has its positive and negative aspects it can be a useful alternative in estimating postmortem intervals if other resources and information on the body found is limited.

RESOURCES:

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