



Pathology Biology Section - 2012

G73 Seasonal and Environment Effects on the PMI Estimation Using the Entomological Approach

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After attending this presentation, attendees will receive novel information about the advantages of practical application of forensic entomology in different environmental conditions (indoors, outdoors, water) and in different seasons.

This presentation will impact the forensic science community by offering new data about the composition of the carrion breeding fauna particularly during the winter season and the effect of global warming on the entomofauna. This presentation will offer as well a statistical approach for the estimation of the season in which the death occurred. This topic is of particular importance in “old cases.”

Forensic entomology is a branch of forensic science in which insects are used as evidence in legal investigations relating to humans or wildlife. The examination, identification, and analysis of insects associated with human remains, combined with the knowledge of insect biology, can provide a further level of detail in addition to medical and anthropological data in the reconstruction of events occurring close to the time of death. In particular, necrophagous insects are useful in studying Postmortem Interval (PMI), postmortem transfer, and presence of drugs or poisons.

Seasons, environment, concealment, and accessibility play an important role in the selection of the carrion breeding insects. It is worth mentioning that during the last 25 years global warming and globalization have modified the species distribution with important effects on the application of the entomological method for the PMI estimation (Turchetto and Vanin, 2010, in Amendt et al., Current Concepts in Forensic Entomology, Springer).

Twenty cases have been considered from an entomological point of view. The cases occurred, during the last two years, in Central Italy which is an important area for the understanding of the global warming effect on the entomofauna.

The bodies were discovered between February and November and the estimated minimum PMI ranged from few days to several weeks. Socially isolated people, drug or alcohol addicts, or old people living alone were involved in the majority of the cases considered. The causes of death included natural, homicide, suicide, smothering, and drug overdose. In four cases the bodies were burned due to fire or electricity. In one case, the body was found in a saltish lagoon.

The insects have been recovered during the autopsy and, where possible, also during the body recovery following the standards and guidelines proposed by the European Association of Forensic Entomology (EAFE, Amendt et al., 2006, Int J Legal Med 121: 90-104).

Statistical analysis of the results reveals a strong correlation between fauna composition and decomposition stage of the body, between the fauna composition and the season of the death (winter vs. summer), and between the fauna composition and the environment (outdoors vs. indoors). No statistical differences have been detected comparing the causes of death. In burned remains, insects of the first waves of colonization (Calliphoridae and Sarcophagidae) arrive without any delay compared with other cases, confirming observations and experiments carried out by Vanin and Cattaneo (Vanin et al., in prep).

Species belonging to Diptera (Trichoceridae, Psycodidae, Stratiomyidae, Phoridae, Muscidae, Fanniidae, Calliphoridae, and Sarcophagidae), Coleoptera (Cleridae, Staphylinidae and Silphidae) and Hymenoptera (Formicidae) were collected. The genera *Trichocera*, *Calliphora* and *Hermetia* showed a fall/winter phenology whereas *Lucilia* (particularly the species *L. sericata*), *Sarcophaga* and *Chrysomya* a summer phenology, with the later species present also during the fall.

The recovered data highlight that *Hermetia illucens* (Stratiomyidae) (species introduced in Europe during the last century) and *Chrysomya albiceps* (Calliphoridae) (reported only from the Southern regions till 1985) are now present in the whole Italian peninsula. In addition the data underline the important role of *Megaselia scalaris* (Phoridae) in the colonization of indoors bodies.

Postmortem injuries caused by arthropods have been reported in two cases. An indoors case shows the activity and the possibility to have postmortem injuries by ants also inside an house, whereas the body recovered from the saltish lagoon showed different lesions on the face and on the body performed by aquatic Isopods (Crustacea, Isopoda).

This work summarizes and statically analyzes information coming from different cases. The data, here presented, represent an important point of reference for the definition of the season of death, for the comparison between different environments. In addition our data confirm the spread of alloctonus species, particularly from the southern regions. This information is important in order to avoid mistakes in estimation of body transfer. Moreover, the significant attention to indoors cases is related with the observation that over 70% of the cases occur in this environment (Vanin et al., in prep).

Forensic Entomology, Global Warming, Statistical Analysis