D66 Insect Evidence Distribution: Tabulation of Primary Indicator Species, the Life Stage, and the Season of Year Used in Final Analysis From 100 Random North American Cases

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The goal of this presentation is to determine which insect species and which of their life stages impact the entomological case analysis.

This presentation will impact the forensic community and/or humanity by determining if certain insect species are predominant, and if so, to concentrate limited research funding and effort on those identified species.

One hundred random cases were selected from case files numbering nearly 700 cases over a 25 year period. The cases selected were between 1996 and 2005 with approximately 10 per year being chosen (many of these cases went to court). Distribution of the cases covered all four seasons with 20 spring cases, 43 summer cases, 23 autumn cases, and 14 winter cases, thus accounting for the many different species of calliphorids (blow flies) found over the different seasons. Geographic distribution extended from Canada (Ontario) to the southern states and from the west coast to the east coast. The insect species used in the case analysis was the primary indicator species and its oldest life stage. This means that usually one species had the oldest life stage from which to base a developmental time postmortem interval estimate as opposed to a succession based estimate where combinations of insect species are found overlapping at different days postmortem. Of the 100 cases, 89 cases used Calliphoridae (blow flies) as the primary indicator species. Two additional cases used calliphorids in combination with other insect groups. Three cases employed the Black Soldier Fly (Hermetia illucens), with two using sarcophagid flies, and two cases using two muscid fly genera (*Fannia* and *Synthesiomyia*). One case used the Red Legged Ham Beetle, with only one non-time of death case employing the German cockroach to explain postmortem artifacts on the remains. The most common insect life stage used for analysis was the 3rd instar larva (this includes post feeding 3rds with 52 cases where these were the primary indicator stage). Puparia were figured in the analysis in 21 cases with 5 cases using adult blow fly species seasonal distribution. A total of five cases used 2nd instar larvae, nine cases with 1st instar larvae, and two cases with nearly hatched eggs. The overwhelming majority of the cases analyzed using insects was for determining time of death (only one in this set was not). The overwhelming primary indicator insect species was the blow fly group. The most used life stage was the 3rd instar larva. This forensic entomologist has been involved with and has seen many research studies spending great amounts of time, money, and other resources in attempting to determine what decomposition stage the carrion is in, or the insect succession when recording collecting and studying the progression of decomposition through to full skeletal remains. What is shown by this tabulation is that it is not the stage of decomposition that is of importance, but the insect life stage and how long it took at what temperatures to grow to that stage. The insects were being evaluated not the corpse. Also, not one of these 100 cases was founded on successional based postmortem interval estimation, but all (except the cockroach case) were based upon developmental based postmortem interval estimations. The successional based PMI requires thousands of hours of insect identification merely to obtain the data base needed for a specific geographic area of the world. If there is plenty of funding, research personnel, and taxonomists available, then research dealing with full succession models could be warranted. However, this is not the method being used in this case work. Therefore, forensic entomologists should concentrate primarily on the life cycles, geographic distribution, and growth and development of the most commonly used primary indicator species, the Calliphoridae (Blow Flies).

Blow Fly, Life Stage, Calliphoridae

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