Forensic Entomology and its Impacts in Forensic Science

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25 April, 2014
Entomology
Forensic Entomology

- Branch of Zoology that studies entomological significance in criminal cases involving animal abuse, neglect, and homicide
- One of the youngest and least represented branches of forensic science
- Deals most heavily with: flies (Calliphoridae, Sarcophagidae, Muscidae), and beetles (Histeridae, Dermestidae, Staphylinidae)
Uses for Forensic Entomology

Medicocriminal:
Civil Proceedings
Abuse and neglect cases
Homicide Investigations

Photos courtesy Dr. Heather Ketchum,
University of Oklahoma
Blow Fly Life Cycle
Stages of Decay

- Fresh
- Bloat
- Active
- Dry
Fresh

Staphylinidae

Silphidae

Calliphoridae
Bloat

Staphylinidae
Silphidae
Cleridae
Histeridae
Calliphoridae
Sarcophagidae
Active

Staphylinidae
Silphidae
Cleridae
Histeridae
Scarabaeidae
Calliphoridae
Sarcophagidae
But What does it Mean?

The process just described is called Succession.
Post-Mortem Interval

Succession, stage of decay, and maggot development are used in the calculation of PMI

Assumption:
Flies detect and oviposit on corpse soon after death
Question:

Can post mortem interval be accurately determined using succession in homicides set in dissimilar ecological surroundings?
Arthropod Activity

<table>
<thead>
<tr>
<th>Fly Species</th>
<th>Location of Body</th>
<th>Duration Since Missing</th>
<th>Calculated PMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Xerophytic Habitat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phaenicia cuprina</td>
<td>2(^{nd}) Instar</td>
<td>96 Hours</td>
<td>92-96 Hours</td>
</tr>
<tr>
<td>Chrysomya ruficacies</td>
<td>2(^{nd}) Instar</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mesophytic Mixed Vegetation</td>
<td>123.5 Hours</td>
<td>132 Hours</td>
</tr>
<tr>
<td></td>
<td>Swamp</td>
<td>121 Hours</td>
<td>120 Hours</td>
</tr>
<tr>
<td></td>
<td>2(^{nd}) and 3(^{rd}) Instar</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>3(^{rd}) Instar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chrysomya megacephala</td>
<td>2(^{nd}) and 3(^{rd}) Instar</td>
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<td></td>
</tr>
<tr>
<td>Sarcophagidae</td>
<td>3(^{rd}) Instar</td>
<td></td>
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</tr>
</tbody>
</table>

- 2\(^{nd}\) Instar: Second instar stage
- 3\(^{rd}\) Instar: Third instar stage
Results

• While differing habitats produced minor changes in arthropod diversity, a noticeable difference was still perceived.
• Differences in fly development, when coupled with temperature and relative moisture content of habitats provided accurate PMI determinations.
• As few as two species of fly can significantly alter PMI calculations.
Future Considerations

• Succession studies in other environments

• Changes in succession due to carcass tampering (burying, hanging, burning)

• Affects of repeated desiccation and rehydration of carcasses
Acknowledgements

• Nadine McCrady-Borovicka, M.S.
• Dr. Pamela Staton
• Dr. Nathan Green
References


Picture References

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http://www.insectoid.info/pictures/dermestidae.jpg

• Cleridae.
http://www.zin.ru/animalia/coleoptera/images/h_800/necrobia_rufipes.jpg

• Histeridae.
http://www.kerbtier.de/Pages/Fotos/Familien/Histeridae.jpg

• Life Cycle.

• Lucilia Cuprina.
http://bugguide.net/images/cache/6Z0L5ZQLNZZ5HFG7FEHEHLR9HZRGLZB8H5Z5HCHQ1LCH7HRHH1
Picture References Cont.

Questions?