COLLECTION OF ENTOMOLOGY SAMPLES TO ASSIST IN THE INVESTIGATION OF WILDLIFE CRIME

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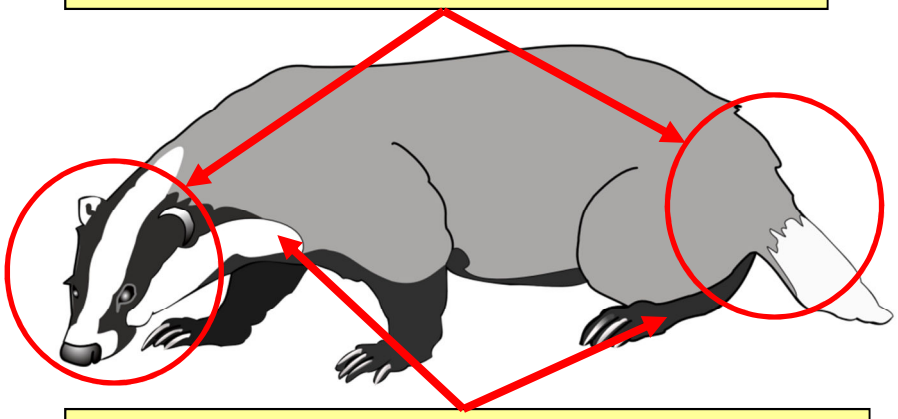
1 Background

Forensic entomology is the use of insects and other arthropods in legal investigations. In wildlife crime this could include the estimation of a period of neglect of living animals or the minimum interval since death of dead animals. It could also include determining where an animal died based on knowledge of the insect fauna on the body. In all investigations the initial objective must be to collect the insect evidence in an optimal manner to permit subsequent analysis (identification and age estimation) by suitably qualified entomologists. The primary role of this information sheet is to provide advice on the methods used for collection of evidence.

2 Where to collect evidence

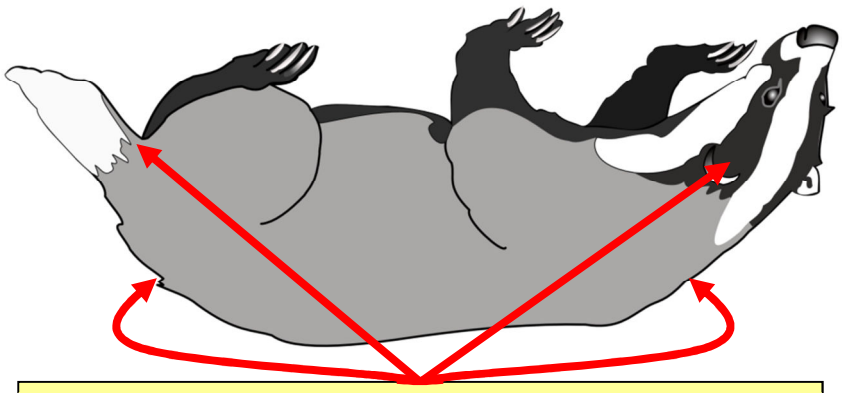
2.1 *Live animals:*

If the animal is moribund, examine for signs of larval infestation around body orifices: head, anal and genital.



Carefully examine the animal for signs of larval infestation at sites of wounding, e.g. around the neck if the animal is snared or the limbs if the animal is caught in a 'gin trap'.

2.2 *Dead animals:*



On dead animals, search for larval infestations around the body orifices, at sites of wounding and underneath the body. Be aware of post-feeding larval dispersal resulting in larvae and puparia being located at a distance from the body, potentially buried in leaf litter or soil.

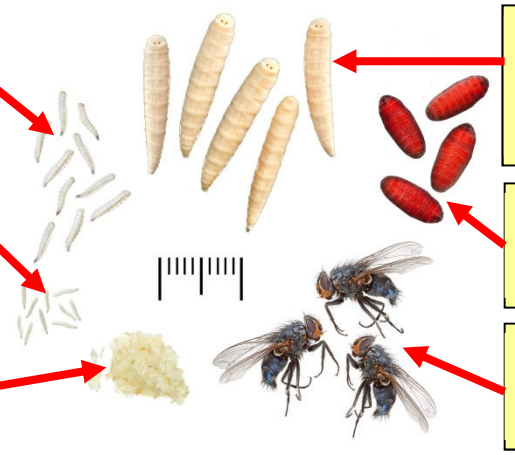
It is essential to collect insect samples that accurately reflect their abundance and diversity on the body, i.e. at least *c.* 20-50 larvae from each site of infestation. Samples from different sites should be stored in separate tubes. While the oldest insects are often the largest visible larvae or puparia, it is important to collect a sample that is representative of the complete range of sizes, as different species can develop to different sizes at different rates.

3 How to collect evidence

2nd instar larvae: May disperse from site of egg laying, collect using medium forceps or teaspoon.

1st instar larvae: Feed at site of egg laying, collect using fine forceps or teaspoon.

Eggs: Laid in orifices, hair, wounds, under body. Collect with fine forceps or brush.



3rd instar larvae: Often feed in large masses. Collect largest using medium forceps or teaspoon. Be aware of post-feeding dispersal.

Puparia: Could be full or empty and several metres from the body. Collect with medium forceps.

Adults: Will fly over body and settle on or near it to lay eggs. Collect with a hand-held insect net.

4 How to preserve evidence

All life stages should be killed before preservation by immersion in hot water (>80 °C). This will fix them to prevent their decomposition. It will also cause full extension of larval stages (see images on right). After about 30 seconds the hot water should be decanted off and replaced with preservative, ideally 70-80% ethanol (ethyl alcohol). The preserved insect evidence should be delivered as soon as possible to an entomologist for identification and measurement of larval stages.

Where possible, a proportion of the sample should be kept alive for rearing to the adult stage which can aid with identification. Samples must be kept alive by placing into containers that allow for air exchange (e.g. commercial maggot bait-boxes or tubes with caps that have had small holes made in them), otherwise they will die. To slow down development, samples can be placed into a refrigerator or into a cool bag with ice packs (but do not place live insects into a freezer).

Left below: Live larva placed directly into ethanol.
Right below: Larva killed in hot water before preservation.

5 Temperature measurement

In order for a forensic entomologist to calculate the age of the insects collected it is vital to estimate the temperatures to which those insects were exposed during their development. Ideally the temperatures at sites of larval infestation will be measured on live and dead animals. A hand-held digital infra-red thermometer is a reliable, non-invasive way to measure larval mass temperatures. A probe thermometer can be used but will disturb the larval mass. For a dead animal it is important to measure ambient temperatures, usually by leaving a digital temperature datalogger at the scene for up to ten days. The data from this logger will be compared to that of a nearby meteorological station to determine the relationship between the two locations. This relationship enables an estimate of scene temperatures during insect development to be calculated from temperatures recorded at the meteorological station before sample collection.