

Tips for preparing voucher specimens

The following are some suggestions based on our experience in recording a wide range of mostly terrestrial insects.

Arachnida – spiders only

Place in alcohol (70-80%) and store in tubes. Do not allow them to dry out. Identification often relies on features of the genitalia (male palps, female epigyne), and dissected parts such as these can be kept in a microvial with the specimen.

Odonata (damselfly- and dragonflies)

Odonata should be kept alive for 24 hours to clear the gut contents, which will otherwise rot. They can be set like Lepidoptera. An alternative is - either after killing them or directly - to place them in a translucent envelope, immerse this fully in acetone overnight, remove it and allow to dry. Do not leave in acetone for more than 24 hours. This preserves the colour very well.

Exuviae can be glued to a card, which is pinned and labelled, or kept in a tube. Keep with the adult, if available.

Orthoptera (grasshoppers, crickets)

These should be pinned and it is useful to set out one side of the wings. It is wise to remove the gut from the abdomen and replace it with cellulose wadding in all but the smallest specimens.

Hemiptera (true bugs)

We would always pin these, rather than card them, as underside features are frequently of use. The legs, antennae and rostrum (piercing mouthpart) are all important for identification, and the legs and antennae should be drawn out from the body. Very small species can be pointed, but pointed specimens are susceptible to damage. Aphids and scale insects need slide mounting.

Neuroptera (lacewings)

These need to be set like Lepidoptera with wings outstretched, as many of the identification features are to do with the venation of the wings. Antennal characters are also used, and sometimes the tip of the abdomen and/or genitalia characters are important (sometimes needing dissection). Leg characters generally aren't used.

Coleoptera (beetles)

The standard method is to set them carefully on card, with the legs, palps and antennae arranged so that all are visible. Carded beetles make it easier to compare sizes and shapes and the coleopterists at Oxford University Museum of Natural History recommend this method. The main downside is that it is difficult to see underside features on carded specimens, and for this reason beetles are sometimes glued on their sides to attach them to the card, or some people prefer to 'point' them (glue them to the point of a card triangle, so that only part of the underside is obscured) to pin their beetles.

Diptera (flies)

As with Hymenoptera, we tend to pin these with asymmetrical wings and legs, so that there is a good chance of seeing all parts of the body on one side or the other. Some groups of flies have the male genitalia in a structure, at the tip of the abdomen, which needs to be 'hinged' out in order to see the required characters; this is best done on the fresh specimen before it hardens. Do not 'set' Diptera like Lepidoptera - this pushes the legs too close to the body and may distort the direction of bristles. In several groups the direction as well as the presence of bristles on the legs and the side of the thorax is essential for correct identification. Most Diptera are better pinned obliquely from the side, rather than the top. Craneflies (Tipuloidea) are best carded or stored in envelopes. Some smaller flies such as chironomids, phorids, ceratopogonids, cecidomyiids etc. need slide mounting - consult specialist literature on these groups.

Trichoptera (caddisflies)

Although the recommended method of preserving caddisflies is to keep them in alcohol, the larger species do preserve quite well as dry, pinned specimens. You need to be able to see the wings (both fore- and hind-) and legs clearly, and the genitalia are important for identification. However, many of the genitalia characters are external, and can be seen clearly without dissection. Sometimes a dry caddis specimen will shrivel up to some extent, and may need relaxing if the genitalia are not sufficiently visible.

Lepidoptera (moths)

The traditional form of setting with wings held out flat is still best practice. Can be useful (as well as aesthetically pleasing) to have the antennae held out at the front. Leg characters are rarely used. For those species that need genitalia examination it is sometimes possible to arrange the male genitalia while the specimen is still fresh, to avoid having to dissect later (at least for larger species such as the marbled minor group).

Hymenoptera (ants, bees, wasps)

These should *not* be set like Lepidoptera! All parts of the body and appendages should ideally be visible. Wing venation is often used to decide the genus in bees and wasps, but the wings do not need to be held out flat, nor do they need to be symmetrical. The wings can be pointed out at one angle on one side of the insect, and then held at a completely different angle on the other, so as to ensure that no feature of the thorax or abdomen is obscured on both sides. The exception to this is for sawflies, in which wing venation is used more, and here it is preferable to have the wings held out flat.

Legs should be held down and away from the body, and again they can be held at different angles on each side of the insect. It can be useful to have the abdomen slightly angled down so that the propodeum (back of the thorax) can be seen (but don't bend it down too far as you may need to see the underside of the abdomen as well!). For some species it is useful to set the mandibles open. For *Andrena* bee species it is useful to have the head turned slightly to one side to see the pronotal collar on the front of the thorax. The genitalia of male Hymenoptera are often useful for identification and can be extracted reasonably easily while specimens are fresh and relaxed. Some sawfly genera can only be identified to species if the female and male genitalia are visible. Those can be extracted from fresh specimens.

Ants can be kept in alcohol or stored dry. Most are too small (and hard!) to pin and are best pointed on a card triangle on a staging pin.

Parasitic Hymenoptera

Chalcidoid wasps can be pointed, but they are extremely fragile and get broken. A safe method is to glue them onto a card mount, slightly obliquely so that the top, sides, underside, antennae and wings can all be seen. Ichneumonidae and Braconidae can be pinned (if large) or pointed, or small species mounted as for chalcidoids.