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## AUTHOR

This manual was written by Gary A. Dunn, Extension 4-H Youth Entomology Specialist from 1979 to 1991.

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# Advanced Specimen Preservation

Now that you are well-acquainted with the many techniques and types of equipment used to collect insects, you can focus your attention on some important techniques for the preservation of insects and other arthropod specimens. The use of proper preservation techniques will ensure that your collection efforts are not wasted and that your specimens will last for many years. Proper preservation also adds greatly to the scientific value of your specimens.

Generally speaking, insect (and other arthropod) preservation is done by two methods. Hard-bodied insects are preserved by

dry mounting, while soft-bodied insects are preserved in liquid. Hard-bodied specimens are those whose external shapes are not altered by the drying of internal organs. Most adult insects are hard-bodied. Soft-bodied insects, on the other hand, undergo substantial shrinkage and distortion as their internal organs dry and decompose. Therefore, most immature insects (nymphs, naiads, and larvae) and some adult insects (for example, lice, aphids, termites, thrips, springtails, Psocopterans, and Thysanurans) are considered soft-bodied.

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## PRESERVING INSECTS

**Temporary storage of specimens.** As a rule, it is always best to mount hard-bodied insects as soon as possible after you have captured and killed them. Working with freshly-killed specimens will prevent damage from handling and pinning. It also allows you the opportunity to arrange the appendages (legs, wings, and antennae) in a manner which is neat and orderly.

However, it is not always possible to mount all of your specimens after each trip into the field. Therefore, it becomes important to know the methods for temporarily storing your specimens until you have time to work on them at a later date.

Most insect specimens can be temporarily stored in a refrigerator for up to a week. After you get permission to use the family refrigerator, obtain a plastic or glass container with a tight-sealing lid. Line the container with paper toweling, then put your specimens **and** a small green leaf inside. The green leaf prevents the specimens from drying out. Specimens can be indefinitely preserved if you place them in the freezer instead of the refrigerator. If you use a freezer, be sure you have a container that seals very tightly or your specimens will become freezer-burned (freeze-dried). When you remove specimens from a freezer, allow time for the container to reach room tem-

perature before removing the lid. This will prevent moisture from condensing on the specimens and possibly damaging them.

Many hard-bodied (adult) insects can be temporarily stored in a liquid preservative with satisfactory results. Occasionally some specimens will be partially covered with a yellowish or brownish stain. This stain is a grease that forms from insect body fluids which have dissolved in the alcohol preservative. If you see your alcohol turning yellow, replenish it with a fresh supply.

If you don't mind having to "relax" specimens, hard-bodied insects can be indefinitely stored in paper triangles (see 4-H 1335, *Basic Entomology*, page 14), glassine envelopes, or layered in small boxes.

Layering specimens is quite easy. Obtain a small container of plastic, cardboard, or wood, and line the bottom with several layers of tissue. Do not use cotton, as the legs and antennae get caught in the cotton fibers and are easily broken. Place a small number of specimens on the tissue "bed," allowing enough room so that none of the specimens are touching each other. Add another layer of tissue and repeat the process until the container is nearly full or until you run out of specimens. Fill any space left above the last layer of tissue with additional layers of tissue to ensure that

there is no movement of specimens when the container is closed.

Before closing the container for storage, be sure to include a label (with locality, date, and collector's name) on top of the last tissue layer. Try to use one container for **each** locality (in order to avoid mixing up the

specimens). If you must place specimens from **different** localities (or dates) in one box, be absolutely sure to separate them in **different** layers within the container. In this case you will need to put a label in each layer.

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## PERMANENT PRESERVATION DRY-MOUNTS

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All hard-bodied insects should be dry-mounted on pins or points, depending on size. It is best to work with fresh specimens or specimens that have been temporarily stored by refrigeration, by freezing, or in alcohol.

**Relaxing specimens.** It is possible to mount dried material by relaxing the specimens using one of the following methods to restore moisture to them, thereby making them flexible and soft. If you try to pin a dried, unrelaxed specimen, it will crumble or the legs will fall off.

Relaxing chambers can be made from any tin or glass container with a tight-fitting lid. Tall containers work best. Place damp paper towels or 1 inch of clean, moist sand in the bottom to provide a humid atmosphere. A small amount of moth flakes or ethyl acetate should be added to prevent mold. The dried insect specimens should be laid in a flat, open dish rather than directly on the damp paper or sand. Use forceps to carefully arrange the specimens so they do not

touch one another. Place the chamber in a warm, sunny spot and check it daily to see if the specimens are flexible enough to mount. Depending on the size of the specimens, this could take from overnight to a week. Do not leave specimens in the relaxing chamber any longer than necessary.

Many specimens can be safely relaxed using steam. All you need is a pan or glass (e.g., Pyrex) container with a lid, a short glass jar, and a heat source such as a stove (see fig. 17). Place the short glass jar in the pan in an inverted position, then fill the pan with two inches of water. Place your dried specimens in a shallow dish and put it on top of the upside-down jar in the pan. Put the lid on and heat the water until it is near boiling, then reduce the heat. The steamy atmosphere will relax the dried specimens in a matter of minutes. When you remove the lid, do so by tipping it at an angle so that water does not drip onto your specimens and damage them.

Many hard-bodied insects, except those covered with scales or hairs (e.g., butterflies, moths, caddisflies, and bees), can be relaxed by placing them directly in very hot water. Sometimes hot tap water will do the trick for small specimens. Usually though, you will have to heat the water in a pan until small bubbles appear at the bottom of the pan. Then reduce the heat to keep the water from boiling vigorously. Place the specimens in the water (most will float on top) and remove them after several minutes.

**Cleaning specimens.** Many specimens, especially if they are taken from light traps, will be covered with dust, scales, grease, and other debris. This not only detracts from their appearance, but it may make it difficult to identify them later on. Always clean fresh or relaxed specimens to avoid damaging them. Place dirty specimens in a small con-

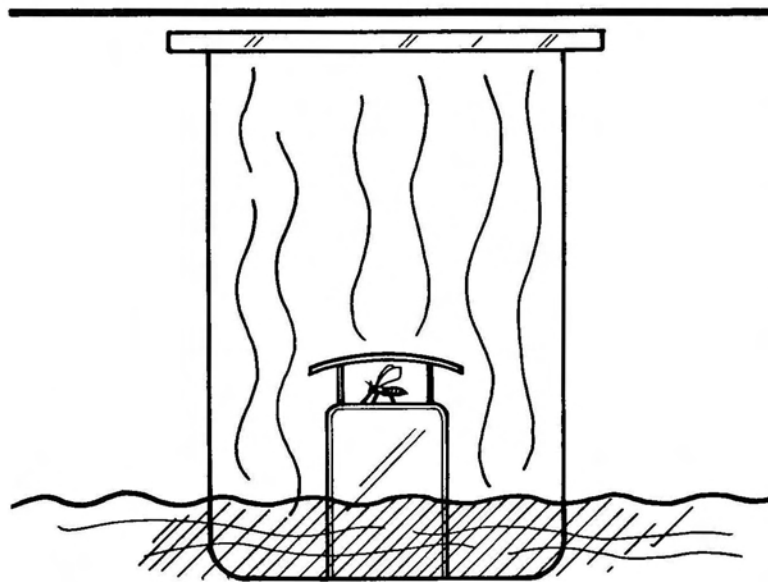


Figure 17. Relaxing a specimen using steam.

tainer filled with diluted household ammonia or household liquid detergent. Be sure to work in a well-ventilated area. After soaking for a few minutes, pick each specimen up with forceps and gently remove any debris with a soft camel-hair brush.

**Repairing specimens.** It can happen to anyone — you transfer a specimen from one box to another and break off a leg or antenna! Fortunately, many specimens can

be repaired by gluing the broken appendage or body part in its original position. Use a small amount of clear fingernail polish, model airplane glue, or white glue to fasten the broken part back in its original position. Be careful not to overdo it with the glue or damage the specimen further.

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## PERMANENT PRESERVATION IN LIQUIDS

All soft-bodied insects should be preserved in liquid preservatives. Alcohol is almost always used as an insect/arthropod preservative. **Never** use formaldehyde.

Two types of alcohol can be used: ethyl (grain) alcohol and isopropyl (rubbing) alcohol. Ethyl alcohol is preferred and is generally used in a 70 to 80 percent concentration (the rest being water). If you must use isopropyl alcohol, it is best to further dilute it with water; use distilled water, if possible. Store-bought rubbing alcohol usually comes in a 70 percent concentration. To be used as a long-term insect preservative, it should be used at a 40 percent concentration. Therefore, you must dilute the store-bought rubbing alcohol with a nearly equal amount of distilled water.

If you use the proper concentrations of ethyl and isopropyl alcohol, your specimens will remain preserved indefinitely without shrinking or hardening.

Loss of color in alcohol-stored specimens cannot be prevented. However, the black

discoloration that can occur can be prevented. This discoloration is caused by bacteria which are not killed quickly by alcohol. They must be killed by a process known as fixation. To "fix" a specimen before preserving it in alcohol, place the specimen in near-boiling water for several minutes. Do not allow the water to boil as this can cause some specimens to explode!

Finally, be sure that all of your alcoholic material is properly labeled. Include a complete locality label made out in indelible ink in each vial.

Vials are normally stored in the upright position. At least once each year, you should check the vials for cracked lids and leakage. Change old, yellowed alcohol. Do not allow vials to go dry, as this will permanently ruin specimens. If you wish to display your vials, place them on their sides and keep them in place with criss-cross pins. Prepare a locality label for each specimen and place it in the vial. Vial racks are also available and can be used.

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## PRESERVING OTHER ARTHROPODS

You may wish to start a collection of noninsect arthropods such as spiders, mites, ticks, scorpions, harvestmen, centipedes, millipedes, or isopods. All of these noninsect arthropods can be preserved and stored in alcohol. Even though many of these arthropods are hard-bodied, they are

not dry mounted because many of their delicate appendages (which are used for identification) would be destroyed in the process of pinning.

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# Storage and Care of Collections

Proper storage and care of your collection will ensure that it will last for a long, long time. You must take every effort to protect your collection from jarring and vibration, dust, light, pests and dampness.

Always keep your specimens firmly pinned to the bottom of a covered box. Keep your collection away from younger brothers and sisters, other nonentomologists, and pets. Whenever possible, keep your collection in a dark, cool location to retard speci-

men color fading. Protect your collection from pests and fungi (molds) by using a fumigant (moth balls, flakes, or crystals — paradichlorobenzene or naphthalene type), and by avoiding moist, humid situations (or use a silica gel desiccant). If specimens are properly cared for, they can last a hundred years or more!

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## Specialty Collections

If you're tired of making a general insect collection, try a specialty collection. Specialty collections might include destructive insects, beneficial insects, immature insects, aquatic insects, life cycles of specific insects, a specific order or a family, or gall-making insects. Use your imagination to think of additional specialty collections.



# The Entomological Community

As an insect collector, you are not alone. Many people in your own community, state, country, and around the world share your interest in the insect world. You have no doubt already made friends with other collectors in your own community or county, but do you know how to go about contacting other people who live outside of your area or perhaps even on the other side of the world? It's not really as hard as you might think since many entomologists belong to various clubs or organizations.

The Michigan Entomological Society is composed of amateur and professional entomologists from Michigan, the Great Lakes region, and beyond. This organization publishes a journal and newsletter, entomology fact sheets, and collecting tips, and has an annual meeting each spring. For further information, write to the Michigan Entomological Society, c/o Department of Entomology, Michigan State University, East Lansing, Michigan 48824-1115.

The Young Entomologists' Society (Y.E.S.) is a group that caters to the young amateur entomologist, but it does have many older members too. The group publishes a journal with articles submitted by members. The group also encourages the exchange of information and specimens among its membership. This is a good group to join if you want to make contact and correspond with other collectors. For information, write to the Young Entomologists' Society, c/o Gary Dunn, 1915 Peggy Place, Lansing, MI 48910-2553, U.S.A.

**Guidelines for corresponding with other entomologists.** By following a few commonsense rules, you can become a reliable part of the entomological community. When you write to others, be friendly and courteous. When someone writes to you, respond as promptly as you can. Remember, if you expect to receive prompt, informative replies, you must be willing to do your part. Offer your comments, answers, opinions, and technical information freely

and you will undoubtedly establish lasting friendships with other entomologists. Someday, if you're lucky, you may even get to meet and collect with your friend.

## **Guidelines for exchanging specimens.**

After you have collected insects in your home community for a number of years, you will probably want to collect insects from other states, regions, and countries. If you are very lucky, you can travel to these distant places and collect the specimens yourself. For many reasons, this is often not practical or possible. However, there is another way — exchanging or trading. All you need to do is contact a collector who lives in or near the desired area and ask if he/she is willing to swap some specimens. Oftentimes other collectors would like to have representative specimens from your area. Don't worry if the particular person you contact is not interested; try contacting someone else.

If you are successful in finding a willing trading partner, here are a few things to keep in mind:

1. Arrange the trade (number and type of specimens) by letter *before* sending any specimens.
2. After agreeing to a particular exchange, send the specimens as promptly as you can. If for some reason you are unable to keep up your end of the agreement, return any specimens you may have received (to preserve your reputation and good standing).
3. Send only perfect, undamaged specimens, and pack them carefully to avoid damage (see next section).
4. Generally speaking, it is illegal to mail **live** insects without a special permit from the U.S. Department of Agriculture. (The exceptions are native, nonpest insects.) If you have questions about shipping live insects, contact the nearest USDA office or the 4-H — Youth entomology specialist at Michigan State University. **Dead** specimens require no permits.

**Mailing insect specimens.** Because of rigorous handling during shipment, all pack-

ages of insect specimens must be carefully and properly prepared (see fig. 18). To successfully mail specimens, you will need two boxes: one for the specimens and one for the specimen box. The larger outside box should be big enough to accommodate the specimen box *plus* several inches of space on all sides.

To package your specimens, put them in the specimen box. If the insects are papered or unpinned, layer them between tissue paper (see page 13). If they are already pinned, firmly anchor them in the pinning bottom (which should be at least 1/2-inch thick). Large, bulky specimens should be held in place with additional pins. This keeps them from swinging about on their pins, thereby damaging adjacent specimens. Cut a small cardboard lid so that it fits **inside** the specimen box on top of the pins. Fill the space between this lid and the box top with layers of tissue. Fasten the box top in place with tape or elastic bands. Now, fill the larger box with several inches of packing material. Use Styrofoam chips, excelsior, crumpled paper, shredded rags, or cotton batting.

After placing the specimen box on top of

the packing material, proceed to fill the remainder of the space with packing material. Fill the box until the packing material holds the specimen box firmly in place, but without crushing it. Now you can tape up the box and address it. In addition to the address label, you should include a separate label which states: "**FRAGILE** . . . Dried Insects for Scientific Study . . . Handle With Care . . . No Commercial Value." Mark the other five sides of the box "**FRAGILE**."

If the box is being sent outside the United States, you must complete and attach a postal customs declaration, which basically states that your box contains "dried insects for scientific study" with "no commercial value" so that it can be sent duty (tax) free. These forms and additional information can be obtained from any post office.

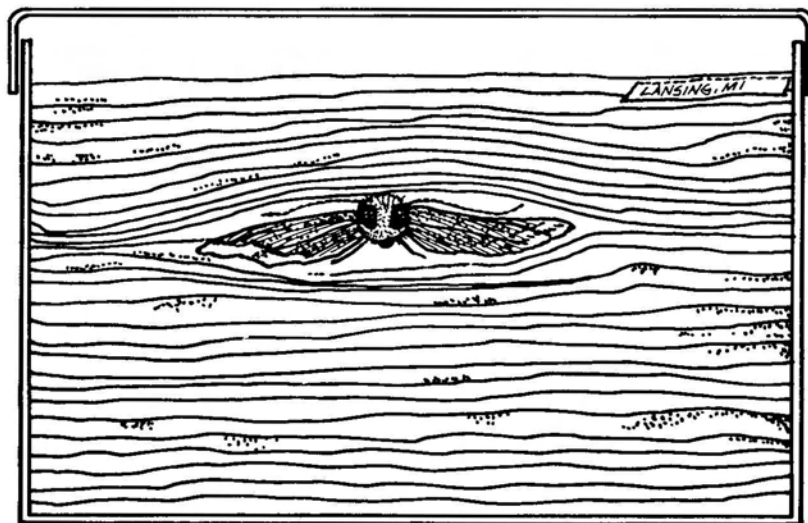


Figure 18. Properly packaged specimens.

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# Summary

Other project ideas and skills beyond the scope of this manual can be found in other 4-H entomology project manuals, newsletters, and other publications. Ask your 4-H leader or your county Michigan State University Extension office about these.

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## NOTES



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