

**Resource  
Manual  
for  
Insect Collecting**

Name: \_\_\_\_\_  
Mr. Ehrheart  
Life Science

## INTRODUCTION TO INSECT STUDY

The study of insects is called *Entomology* and scientists that specialize in insect study are called *Entomologists*. Entomology is one of the largest fields of biology, simply because of the large variety and number of insects- both known and yet to be discovered. Over 1,000,000 (one million) species of insects are known to exist, and new species are discovered each day.

Insects are found in many environments. Some species live their entire lives in water, others on land. Some live on land only briefly as adults after developing under water or under ground. In North America, most insects live as adults from a few hours to several months, but few survive the winter.

The goal of most adult insects is to lay as many eggs as possible before they die. Some insects are not even able to eat, all they do is reproduce. The eggs, or a larval form which develops from the egg, will lie dormant over the winter and develop into a new adult after the weather improves. At first this process appears very simple, but the development of the eggs to new adults is often the most interesting part to study. For example, some insects live 15 years as larvae, but only a few weeks as adults!

With a few exceptions, insects go through a process from egg to adult called *metamorphosis*. Metamorphosis means "change." All living organisms change as they grow and develop, but the changes that insects go through are quite amazing. We all have heard of the changes that butterflies go through from egg, to larva, to chrysalis, to adult. But that is just in butterflies. These changes are very different among other groups of insects and could easily present enough questions to last a lifetime of study.

Another area of study deals with insect management. We usually place insects into one of two general groups, "beneficial" and "harmful." An example of an insect that is beneficial is the ladybug. Ladybugs eat aphids which damage food and ornamental plants. This example also shows us an insect that we think of as harmful- the aphid. But this distinction between "good" and "bad" is not always so clear.

At first glance, the honeybee might be considered as harmful to man because it has a painful sting. But we also know that honeybees are responsible for pollinating thousands of species of plants. It has been estimated that 70% of the food we eat depends on pollination by bees. So the benefits far out-weigh the harmful sting.

Similar "good versus bad" arguments can be made about gnats and mosquitoes. Think about the food chain from gnat or mosquito larvae in a pond, to the larger larvae (like dragonfly naiads) that eat them, to minnows and crayfish that eat the larger larvae, to trout and walleye that eat the minnows and crayfish, to eagles, bears, and man that eat the trout and walleye. Examples like this teach us to look at the whole system, not just the pesky gnat or mosquito buzzing our ear. But what if the mosquito carries a disease that harms man? This is where management decisions must be made.

Insect collections are a first step to becoming a skilled and informed biologist. Insect collections teach you about the diversity of life that is around you every day. They also help to develop good scientific skills in collecting, identification, and observation. Insect collecting is also a hobby that thousands of non-professional biologists enjoy. You may decide to start a collection of every beetle in your state, or every dragonfly in the United States. Just remember to label and preserve everything correctly, or it is of no use to anyone.

## MAJOR INSECT ORDERS AND WHERE TO LOOK FOR THEM

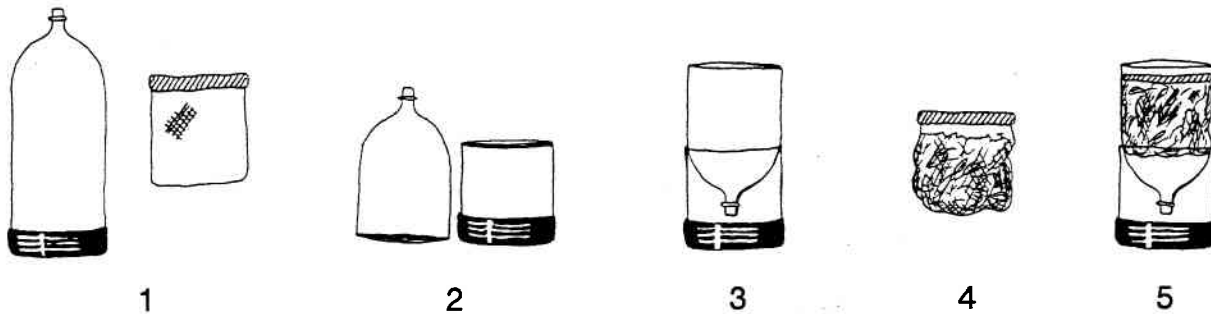
COLEOPTERA	- Beetles	The largest order of insects. Found almost anywhere. Check lights, ponds, leaf litter, rotten logs, under rocks, fungus, dung, flowers, and vegetation.
COLLEMBOLA	- Springtails	Damp areas. The best place to find them is in old leaf litter that is funneled.
DIPTERA	- Flies	Many feed on flowers. Many lay eggs in carcasses, dung, or old fruits. Some will come to lights.
EPHEMEROPTERA	- Mayflies	Attracted to lights. Look near ponds and streams on vegetation during the day.
HEMIPTERA	- Bugs	This group feeds mostly on vegetation. Look in gardens and on flowers. Some can be found on the surface of ponds and many will come to lights.
HOMOPTERA	- Cicadas, Aphids and Hoppers	This group also feeds mostly on vegetation. Check gardens and flowers. Many come to lights.
HYMENOPTERA	- Ants, Bees and Wasps	Many feed on flowers or hunt among vegetation. A few come to lights. Many have painful stings or bites, so use caution when collecting.
ISOPTERA	- Termites	Leaf litter. Rotting wood.
LEPIDOPTERA	- Butterflies and Moths	Adults feed on flowers. Larvae feed on vegetation. Moths come to lights.
NEUROPTERA	- Lacewings, Ant Lions, Dobson Flies	Many feed on aphids in vegetation. Many will also come to lights.
ODONATA	- Damselflies and Dragonflies	These are daylight hunters. Find them around ponds and streams or near mud holes in dry climates.
ORTHOPTERA	- Crickets, Mantids, Roaches, Walking Sticks, Grasshoppers	Most feed on vegetation. Many are hard to see so watch closely. Crickets and roaches can be found under rocks or logs.
SIPHONAPTERA	- Fleas	In the fur of many mammals.
THYSANOPTERA	- Thrips	Look inside flowers or on vegetation.

## MAKING AN INSECT FUNNEL

Biologists use a funnel to collect small insects and other invertebrates. This funnel is called a "Burlese Funnel." You can make a similar funnel from household items. All you need are an empty cola bottle (2- or 3-liter), scissors, a mesh bag like the ones used for holding onions or flower bulbs, and a small pile of rotting leaves and twigs. The sample of leaves and twigs should be taken from a damp area beneath a stand of trees. The material nearest the soil usually contains the best variety of insects.

The insects that you might collect include springtails, ants, termites, and small beetles. You may also find the larvae of many insects. You will probably also catch a number of small spiders and mites. Spiders and mites are not insects. You can tell this because spiders and mites have eight legs while all insects have six legs.

- Step 1. Find an empty, clean, 2- or 3-liter soda bottle, a mesh bag, and scissors.
- Step 2. Cut the soda bottle in half with the scissors. Try to make the cut level so that one side of the bottom is not higher than the other. Remove the lid if it is still on the bottle.
- Step 3. Turn the top half of the bottle over and set this into the bottom half. This will make a funnel that separates the top half of the trap from the bottom. Be sure that the mouth of the funnel does not touch the very bottom.
- Step 4. Find your leaf sample and fill the mesh bag. Do not pack the leaves too tightly in the bag or the insects may not be able to get out later.
- Step 5. Put the mesh bag of leaves into the top of the funnel. Make sure the bag fits below the rim or some insects may be able to crawl over the top.



The insects that you collected inside the leaves are there in part because of the moisture. As the leaves on top begin to dry out, the insects will move lower. Eventually they will reach the bottom, crawl between the mesh, and fall into the funnel. They will then slide into the lower half of the trap where you can collect them. Put the captured insects into your collecting jar or alcohol.

Do not mash or squeeze the bag after it is in the funnel. This will cause small pieces of the leaves to fall into the bottom. A lot of debris in the bottom will make it harder to see the small insects that fall through.

The leaves can be dried faster by hanging a light bulb above the funnel. The heat from the bulb will work down through the leaves and cause the insects to exit into the bottom faster. If you use a light, be sure that the bulb does not touch the funnel, leaves, or bag. This may result in too much heat that could kill the insects before they fall into the trap. Too much heat could also melt the funnel or cause a fire, so watch the funnel closely.

# PRESERVING AND MOUNTING INSECTS

Insects can be preserved in a variety of ways using alcohol, pins, points, and triangles. All of these methods have standard techniques that have been accepted by entomologists (people that study insects). These same methods and techniques should be used in your insect collection.

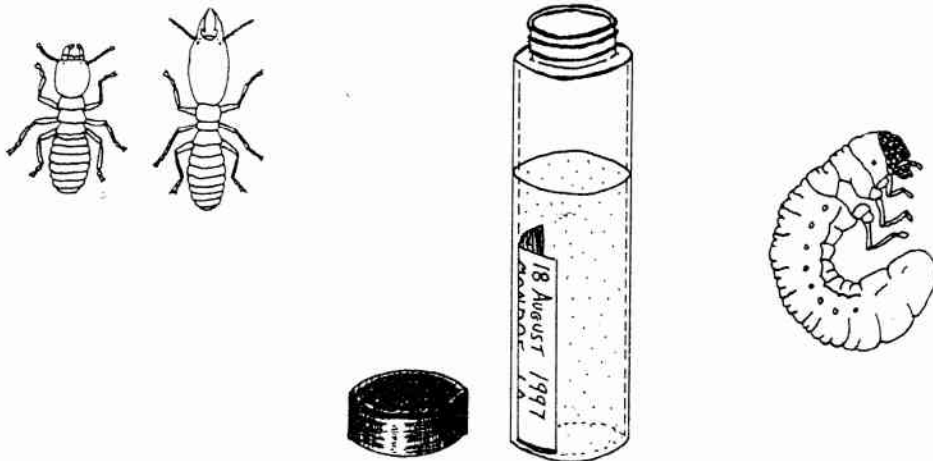
## ALCOHOL

This method should be used for soft-bodied insects such as termites. These insects are very "fleshy" and will shrivel if they dry out. Most insect larvae, such as caterpillars, beetle "grubs", and maggots, also must be placed in alcohol. Remember that alcohol is very flammable and should be used with caution.

Two types of alcohol can be used for this method. Ethyl alcohol or "corn alcohol" is typically used by museums. This alcohol should be used at a concentration of 45%. For example: to make 100 ml of ethyl alcohol insect preservative, you should mix 45 ml of ethyl alcohol with enough water (55 ml) to equal 100 ml.

The second type of alcohol that can be used is isopropyl alcohol or "rubbing alcohol". This alcohol should be used at a concentration of 70% which is the standard concentration sold at drugstores. This alcohol is less expensive than ethanol, can be purchased in pints from any drugstore, and is ready to use right out of the bottle. For these reasons, "rubbing alcohol" is recommended for most student insect collections. Rubbing alcohol is poisonous if swallowed and should be kept away from small children.

A label containing the date and location the insect was caught, as well as the name of the collector, should be filled out with pencil or permanent ink. This label should be placed in a glass vial or jar with the insect specimen. The vial is then topped off with alcohol. Other labels containing ecological data and the name of the insect can also be placed in the alcohol with the specimen. One label with the name of the insect should be pinned next to the vial so that it can be read without disturbing the specimen. The vial is attached to the pinning board by laying it down and crossing two insect pins (like scissors) over each end.



## PINNING

This method should be used for most insects. Pinned specimens should be hard-bodied so that they will not shrivel badly when dry, and large enough to be pinned without crushing or breaking the specimen. Pinning is preferred for mounting most butterflies, moths, beetles, grasshoppers, bugs, bees, dragonflies, and cicadas.

Insect pins should be used instead of household straight pins or needles. Insect pins can be purchased from any biological supply dealer and many university bookstores. They are generally sold in packages of 100 and come in many thicknesses. Pin thickness is designated by a number (000, 00, 0, 1, 2, and 3). Number 000 pins are the thinnest and number 3 pins are the thickest. A variety of thicknesses is desirable for serious collectors, but the cost of these pins makes a variety expensive for student collections. If you are only using one size, choose a number in the middle (such as 0 or 1). These sizes will mount a wide variety of specimens.

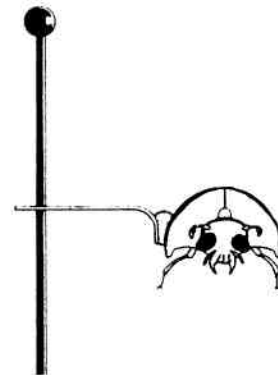
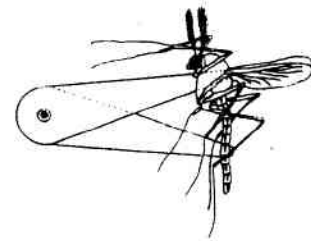
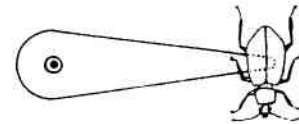
Most insects are pinned through the right side of the thorax so that the mid-line of the body is not damaged. There are some exceptions to this general rule such as with the butterflies and moths (Lepidoptera) and the beetles (Coleoptera). Butterflies and moths are pinned through the center of the thorax. Beetles are pinned through the right wing cover (elytra). In all cases, the pin should be positioned so that it does not damage a leg when the point emerges through the bottom.

## POINTS

Hard-bodied insects that are too small to be pinned should be mounted on "points". A point is a small, triangular piece of heavy paper about 8 mm (3/8 inch) long. These can be cut from index cards with scissors or a commercial punch.

Points can be handled by sticking the tip of an insect pin into the large end. The insect is glued or cemented to the point in one of three ways. White glue, model glue, and "insect glue" all work well.

- 1: For small, flat-bodied insects-  
Touch one side of the point's tip to the glue. Place the insect on the glue so that it is well balanced and the point emerges from under the right side of the specimen. Dry.
- 2: For small, long insects that will "droop" over the point-  
Stack two points and align them evenly. Pierce both points with the insect pin then spread them apart like scissors. Place glue on the tips of both points as above. Place the insect on its right side across both points. Dry.
- 3: For small, high-bodied insects-  
Slide the point slightly farther up the pin. Bend the tip of the point down. Touch the bent portion to the glue and attach the point to the right side of the insect. The legs of the specimen should hang down, free from the glue.



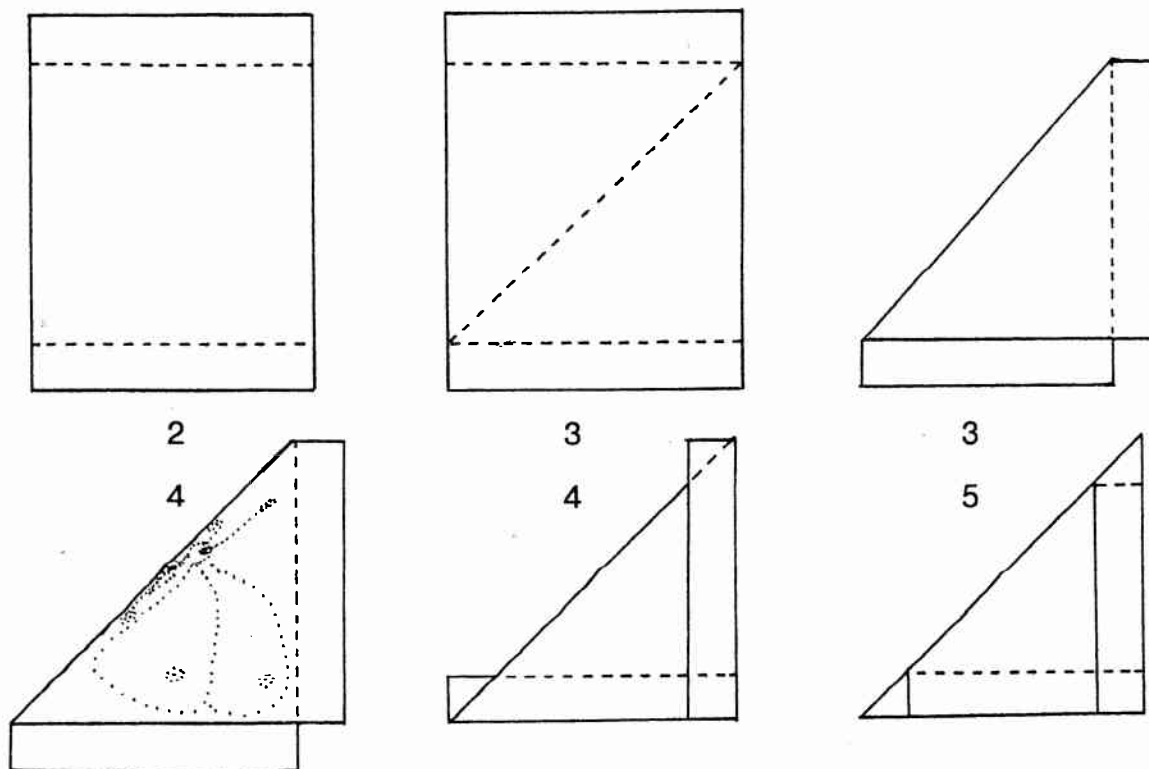
## TRIANGLES

Envelopes or triangles are used to package butterflies until they can be spread and pinned for display. Commercial envelopes made of glassine- a slick, transparent paper- can be purchased from biological supply dealers and many university bookstores. Students can make their own butterfly triangles from paper for transporting butterflies from the field to home. The butterflies can later be relaxed, spread, and pinned for the student's collection.

The following directions show how to make triangles from plain typing paper. The inexpensive, smooth paper works best because it does not act like sandpaper against the butterfly's wings. Exact measurements are not important, but this example details the steps for making four triangles from one regular sheet of paper. These triangles can also be used for storing moths, damselflies, and dragonflies.

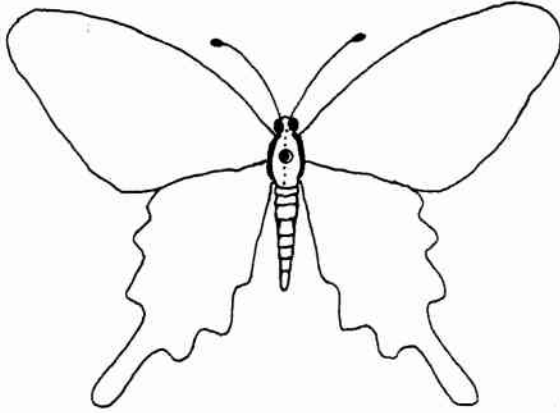
### Making butterfly triangles:

1. Cut the sheet of paper in half both length-wise and cross-wise to make four equal pieces. This will give you four small sheets about 11 X 14 cm (4.25 X 5.5 inches). Each of these pieces can be used to make one triangle.
2. The pieces of paper you will work with are only one-fourth of the original sheet. Crease the top and bottom 1.5 cm of the piece of paper. This will outline a square (11 cm X 11 cm) in the middle. (See illustration below.)
3. Match the opposite corners of the square and fold the piece of paper to make a triangle with two tabs. (See illustrations below.)
4. Place the dead butterfly or other specimen in the triangle and fold the tabs over the openings. (See illustrations below.)
5. Secure the triangle by wrapping the rest of each tab around the triangle's tips. (See illustration below.)

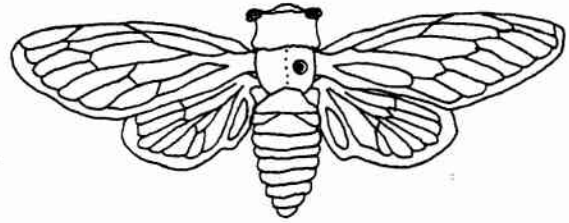


# WHERE INSECTS ARE PINNED

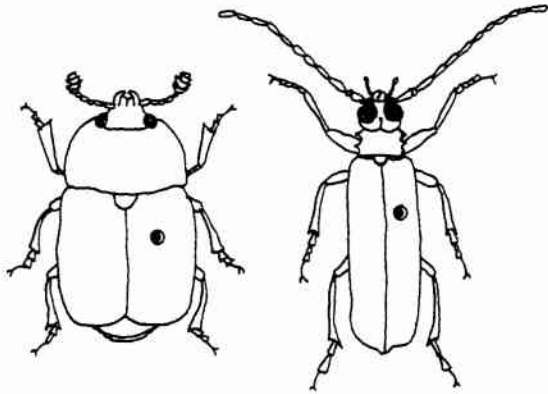
● = PIN LOCATION



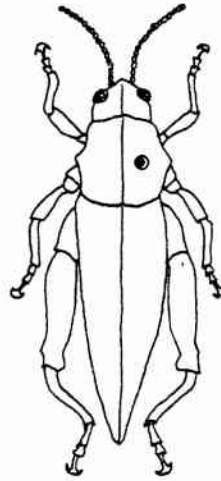
BUTTERFLY



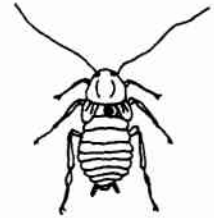
CICADA



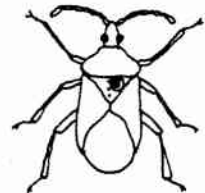
BETTERLES



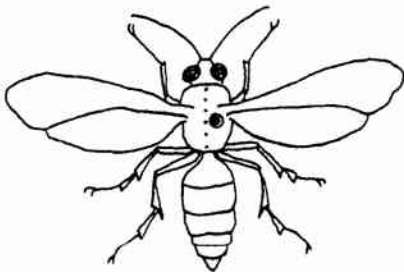
GRASSHOPPER



ROACH



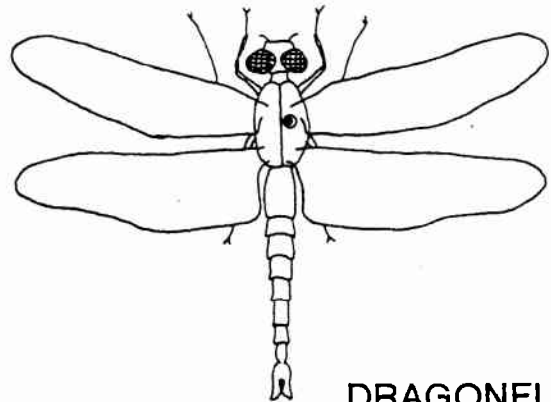
STINK  
BUG



WASP



FLY



DRAGONFLY

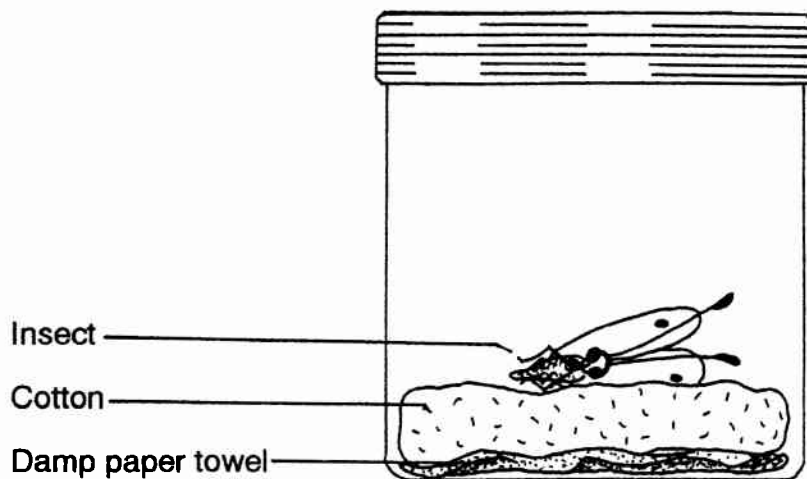
## RELAXING BUTTERFLIES AND MOTHS

If your butterflies and moths are stored in triangles or left in your collecting jar for a while, they may be too dry for spreading. To fix this, you must "relax" the specimens. Insect specimens should be placed in an air-tight jar or plastic storage box with a damp paper towel. You can put several insects in one container, just be sure that you keep track of where and when each was collected.

Do not put the insects directly on the wet towel or allow excess water to run onto the insect. To prevent this, you may want to place the specimen on a layer of cotton balls above the paper towel. You must leave the insect in the jar overnight or for several days. This will depend on how dry the insect has become.

To check the specimens each day, remove one from the jar. Carefully hold the insect's body with your fingers or forceps, but do not handle the wings. Using a probe (not your fingers), gently push on the wing near the insect's body. When the wings will open with gentle pressure, your insect is ready for spreading and pinning.

Keep in mind that you can avoid the trouble of relaxing your specimens if you will take the time to spread and pin them soon after they are collected.



# LABELING YOUR INSECTS

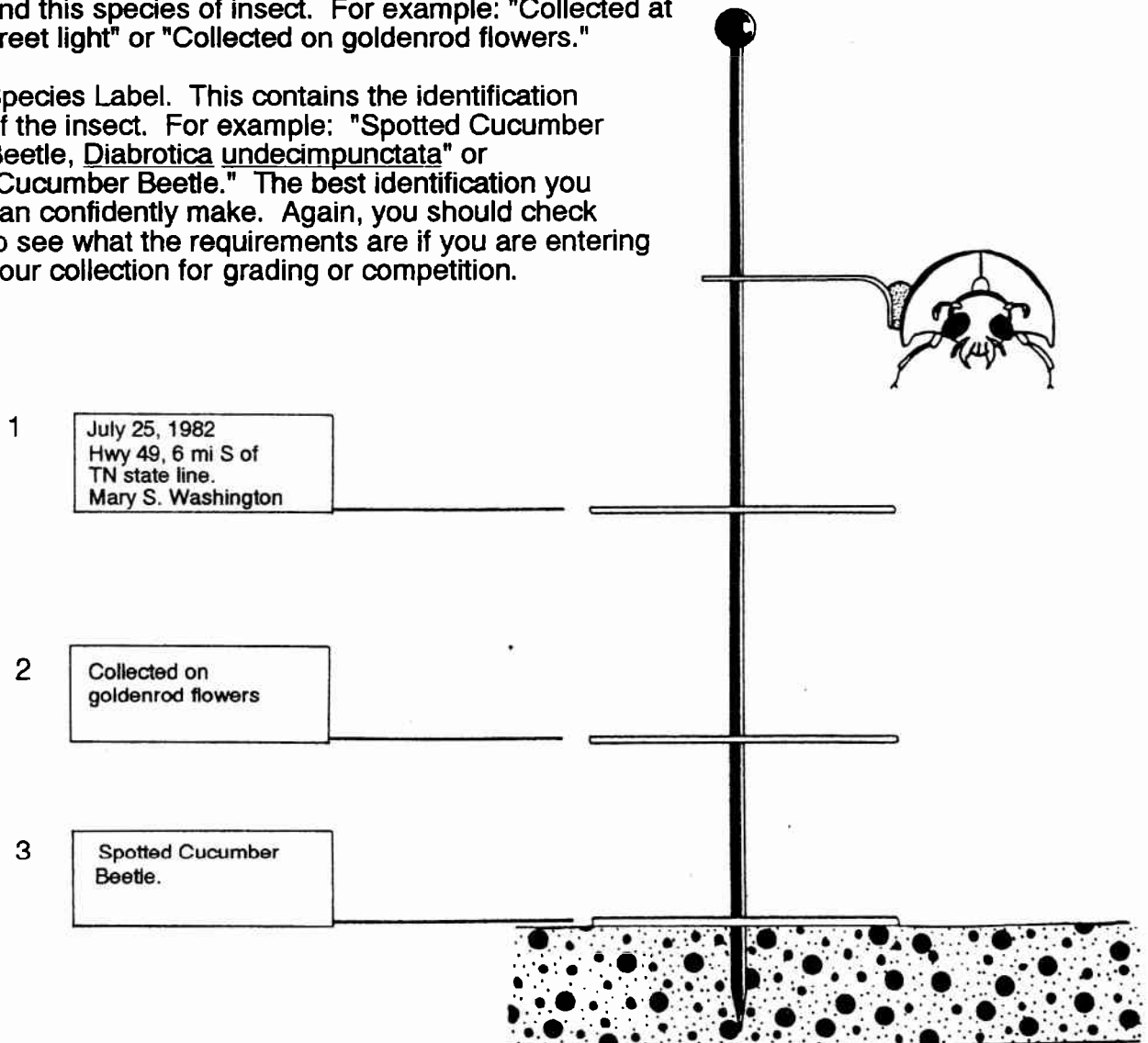
Museum collections identify each insect with three labels. This method will be outlined below. Many student collections only require one label. If your collection will be graded in the classroom or at a larger event (such as a science fair or 4H competition) you must check their requirements. You may only be required to put a species label (label 3 below) with each specimen. You may also be penalized for adding other labels.

The mounted insect (either pinned or glued to a point) should go first. All of the specimens should be positioned so that their backs are at the same level on the pin. About 1/4 of the pin should stick out above every insect specimen. The species label lies directly on the pinning board in your display case. The other labels (if used) should be placed uniformly between the insect specimen and species label.

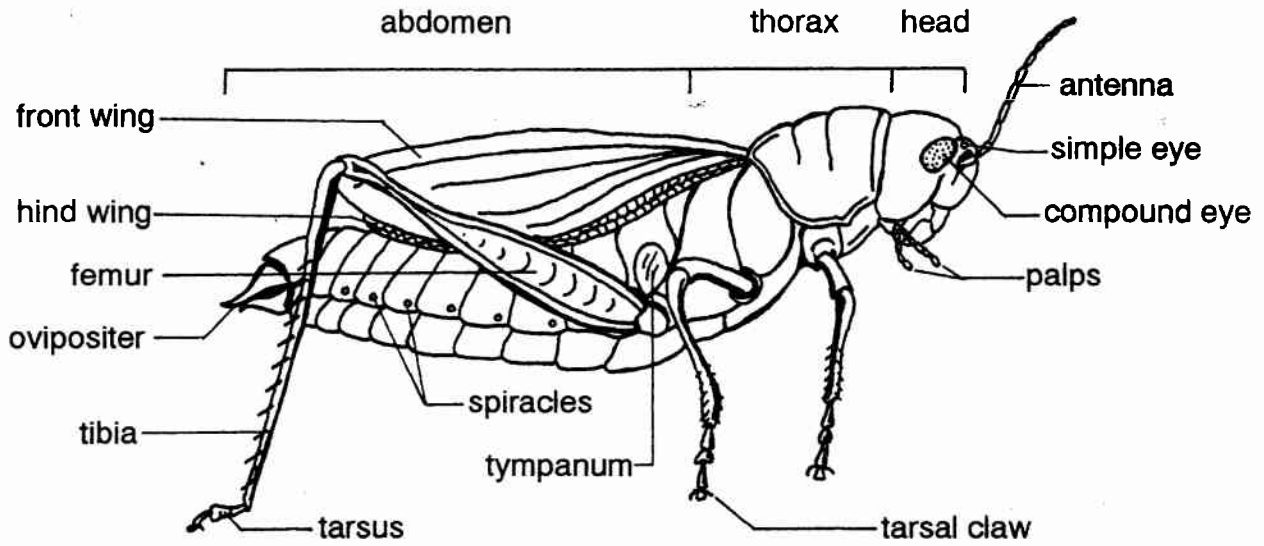
Label 1. Collecting Data. This contains the date, location, and collector name. The date is always written out in full, never abbreviated. For example: "July 25, 1982," NOT "7/25/82." The location should be recognized on a map. For example: "Hwy 49, 6 mi. S of TN state line", NOT "Behind Smith's Auto Parts." The collector is written last: "Mary S. Washington."

Label 2. Ecological Data. This contains information that tells future collectors where to find this species of insect. For example: "Collected at street light" or "Collected on goldenrod flowers."

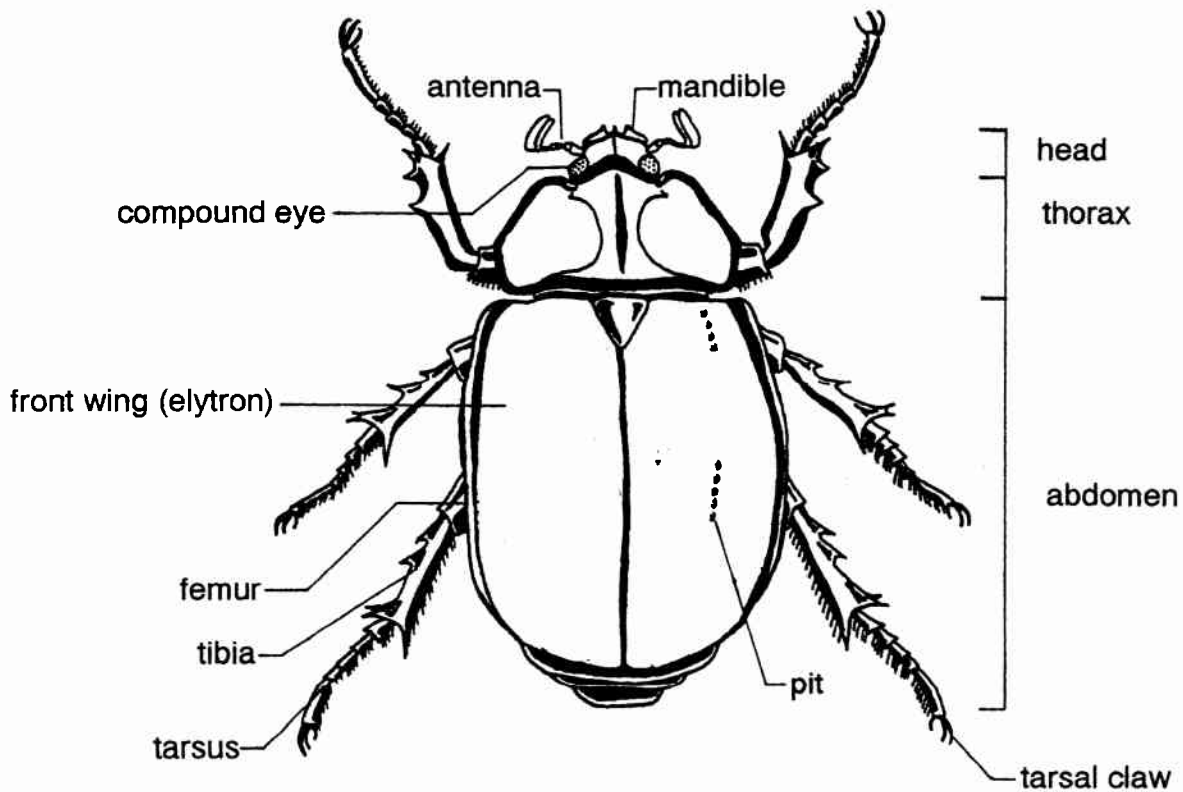
Label 3. Species Label. This contains the identification of the insect. For example: "Spotted Cucumber Beetle, *Diabrotica undecimpunctata*" or "Cucumber Beetle." The best identification you can confidently make. Again, you should check to see what the requirements are if you are entering your collection for grading or competition.



# ANATOMY OF THE GRASSHOPPER AND BEETLE

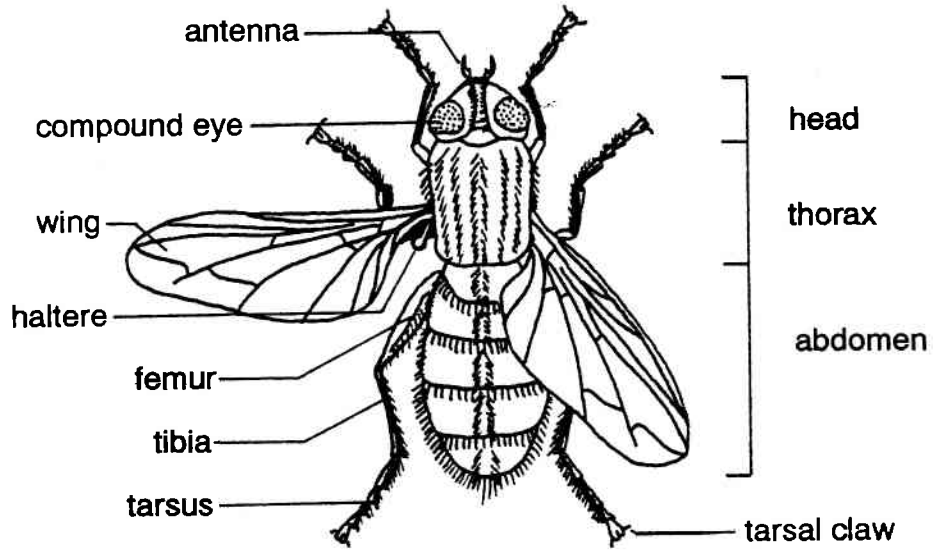


GRASSHOPPER

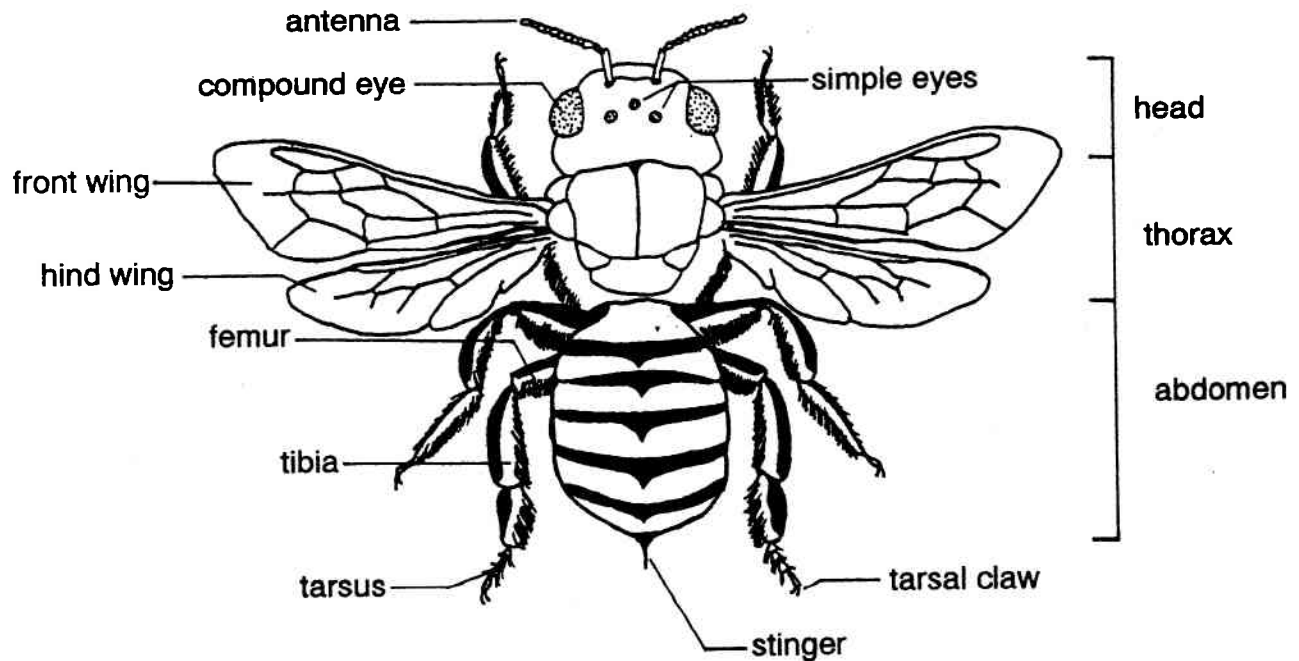


BEETLE

# ANATOMY OF THE FLY AND BEE



FLY



BEE

Squash Bug  
*Anasa tristis*

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

--

Squash Bug  
*Anasa tristis*

ANOPLURA	MECOPTERA	
COLEOPTERA	NEUROPTERA	
COLLEMBOLA	ODONATA	
DERMAPTERA	ORTHOPTERA	
DIPTERA	PLECOPTERA	
EMBIOPTERA	PROTURA	
EPIHEMEROPTERA	PSOCOPTERA	
HEMIPTERA	SIPHONAPTERA	
HOMOPTERA	STREPSIPTERA	
HYMENOPTERA	THYSANOPTERA	
ISOPTERA	THYSANURA	
LEPIDOPTERA	TRICHOPTERA	
MALLOPHAGA	ZORAPTERA	