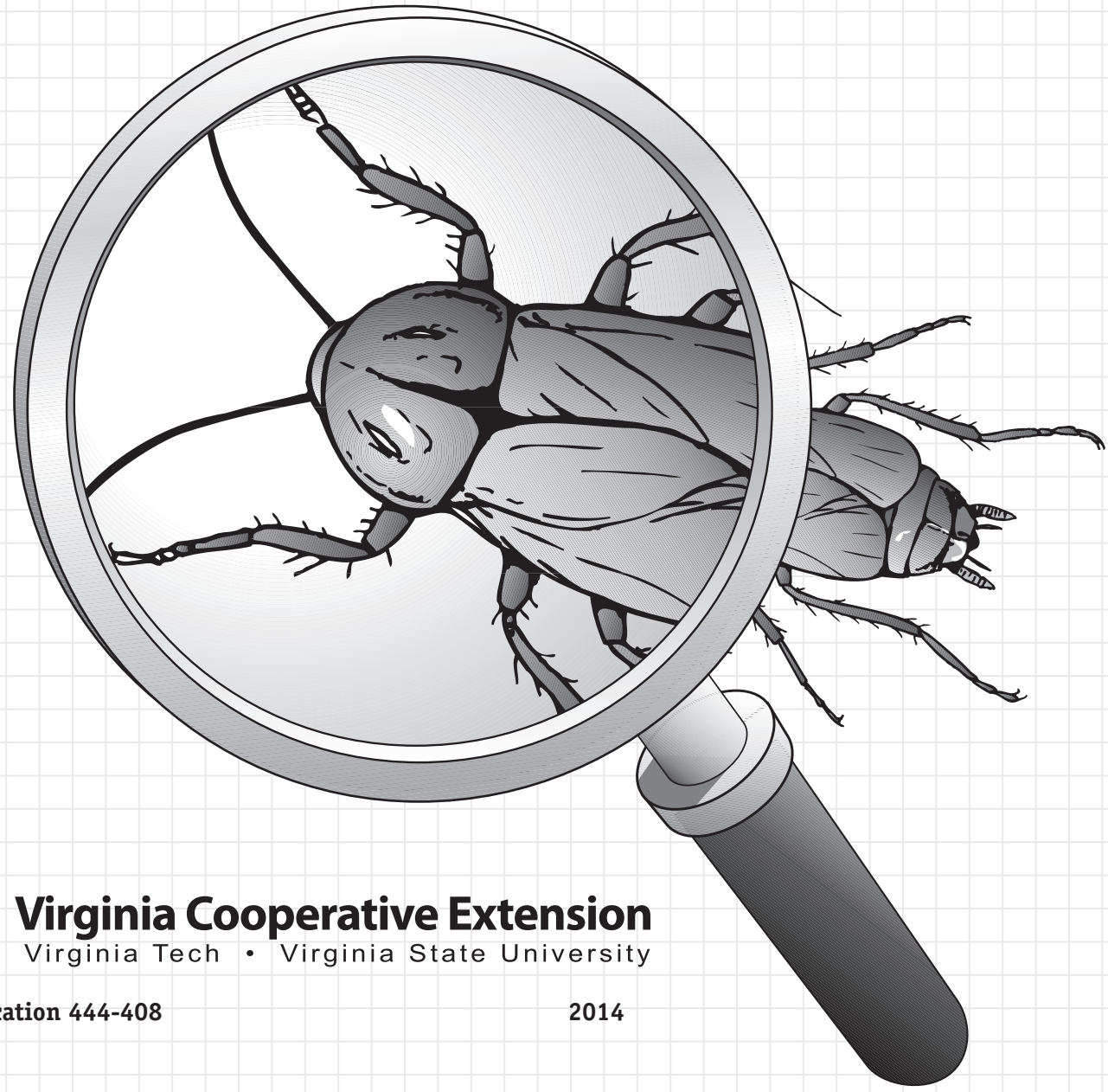
Adventures with Insects

4-H Entomology Project Book

18 U.S.C. 707



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Welcome to 4-H Entomology

Welcome to the 4-H Entomology Project. It will introduce you to many new and exciting experiences. The Entomology Project is fun; it may help you prepare for the study of insects as your life's work, or help you learn how important insects are in the lives of everyone.

The 4-H project will guide you in this first study of insects. Your Extension agent and 4-H leader are advisors to help you solve your problems. Ask for and follow their advice closely.

Ask your agent or leader for a project book and keep complete and accurate records. This is an important part of the project. You may use additional sheets if necessary. Enjoy your project and plan to participate in 4-H Entomology Unit II.

Acknowledgements

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Insects Are Interesting

There are more different kinds of insects in the world than all other living things put together. Some are so small that we need a microscope to see them and others are several inches in size. Insects are so numerous and widespread they can be studied practically anywhere; in the backyard, the garden, in the house, or anywhere people travel in the world.

Entomologists, the scientists who study insects, estimate that there are about a million species of insects worldwide. In terms of numbers, they are the most abundant of land animals.

The 4-H Entomology Project is designed so members of all ages can take part. Certain activities can be carried out over several years. They are designed so you can use local resources. If you live in a rural area, study the open fields. If you live in an urban area, observe insects in and around your home and use the Internet as a reference.

The activities listed in this book are to be used as guides. Keep in mind the Entomology Project connects to many other 4-H projects.

The following icons is used throughout the series:

Questions to Consider

What You Can Do and Learn

Step 1.

a. Learn "What an insect is."

b. Make or buy

(1) Collecting net.

(2) Killing jar.

(3) Insect pins.

(4) Insect collecting and display box.

c. Collect, properly mount, identify, label, and exhibit at least 25 different adult insects, representing as many orders as possible.

d. Protect your collection from scavenger pests.

e. Attend club meetings.

f. Give at least one demonstration or illustrated talk at a meeting.

g. Keep your record book up to date.

Step 2.

a. Learn to recognize the main body parts of an insect.

b. Make and use:

(1) Spreading board.

(2) Pinning block.

c. Collect, properly mount and label, and exhibit at least 100 different adult insects.

d. Identify the order of all the insects you collected and arrange the specimens by order in your display box.

e. Learn the scientific and common names of at least five insects in your collection.

f. Assist your leader.

g. Give at least one demonstration showing what you have learned.

h. Keep a record of your work.

i. Consider all questions thoughtfully, and respond in your project book or in a journal.

What an Insect Is (SOL: 4.1, 7.5)

The animal kingdom is divided into large groups called **phyla,** which have similar characteristics. Animals with backbones (vertebrates) and an inner skeleton, such as humans, cats, dogs, fish, birds, turtles, snakes, lizards, frogs, and toads, belong in the Phylum Chordata.

The invertebrates have no backbone. There are several phyla in this group, including the Phylum Arthropoda, insects and their relatives. Invertebrates also include, Phylum Mollusca, snails, slugs, clams, and oysters; Phylum Annelida, earthworms and leeches; Phylum Nemotoda, round worms and nematodes; Phylum Platyhelminthes, flatworms, flukes, and tapeworms; and Phylum Echinoderms, starfish, sea urchins, and sand dollars.

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Arthropods

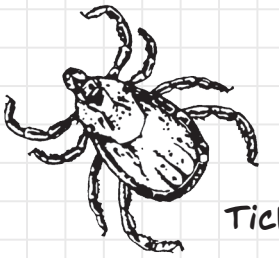
The phylum Arthropoda is further divided into Classes. The common classes of Arthropods are:

1. **Arachnida** (harvestman, scorpions, pseudoscorpions, spiders, mites, ticks)

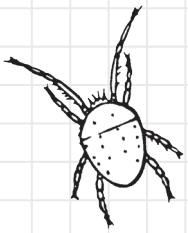
   a. Have the head and thorax combined into one part (cephalothorax);

   b. Have no antennae;

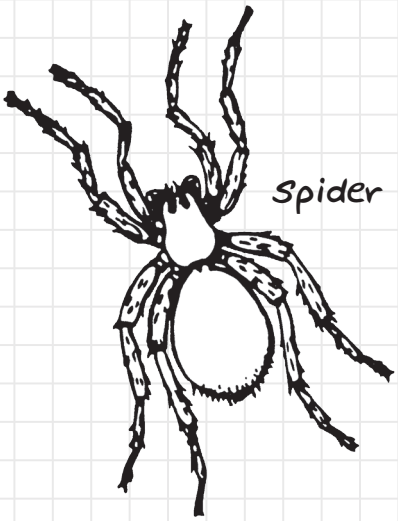
   c. Have four pairs of legs.



Tick



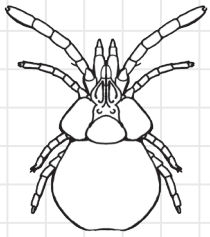
Tick

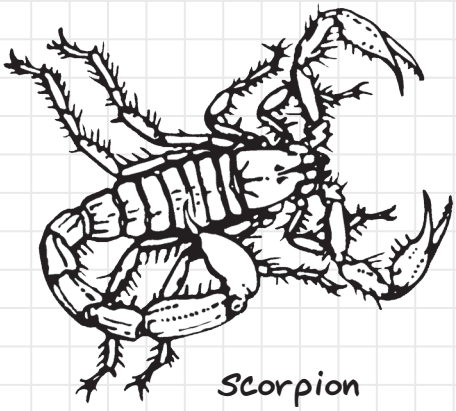


Spider

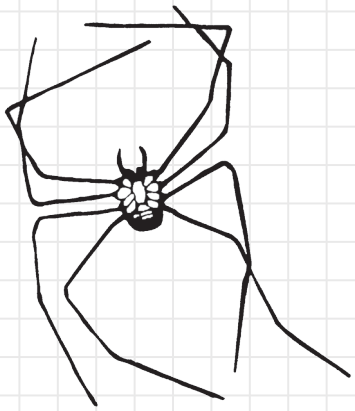
Mature Chigger

(note: immature chiggers have only 3 pair of legs)

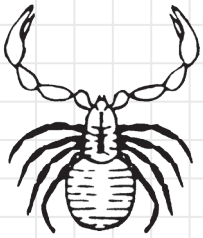




Scorpion



Harvestman



Pseudoscorpion

2. **Chilopoda** (centipedes)

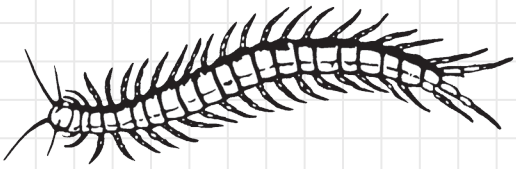
   a. Are generally flattened, many-segmented, long-bodied animals;

   b. Have one pair of moderately long antennae;

   c. Have one pair of legs to each segment;

   d. Are usually swift runners and inhabit the soil;

   e. First pair of legs are modified into poison fangs! They are predators.



Centipedes

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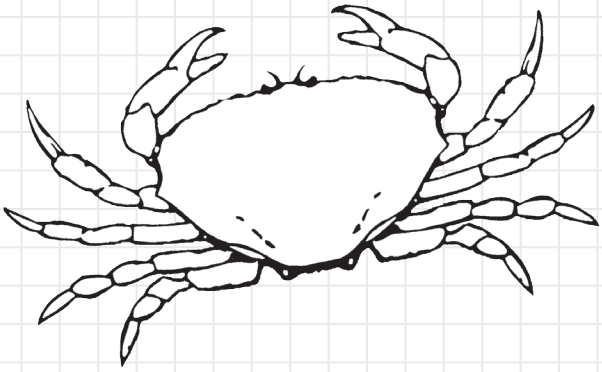
3. **Crustacea** (crayfish, shrimp, crabs)

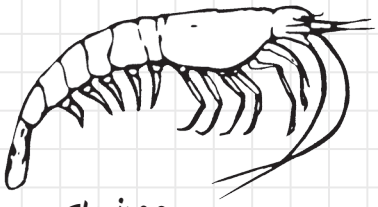
   a. Have the head and thorax combined into one part (cephalothorax);

   b. Have two pairs of antennae;

   c. Have at least five pairs of legs

Crab

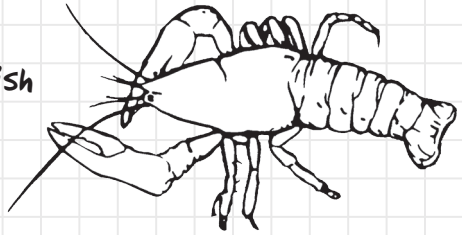




shrimp

Sowbug

Crayfish



4. **Diplopoda** (millipedes, thousand-legged" worm)

   a. Are generally rounded, many-segmented, long-bodied animals;

   b. Have one pair of short antennae;

   c. Have two pairs of legs attached to each body segment;

   d. Coil in a characteristic manner when disturbed.

Millipedes

5. Hexapoda or Insecta (insects)

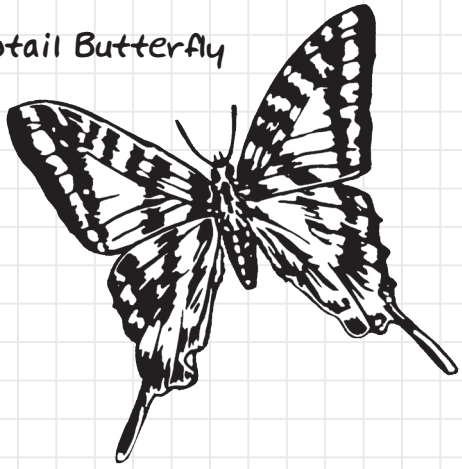
   a. Have a body divided into three general regions (head, thorax, and abdomen);

   b. Have three pairs of legs;

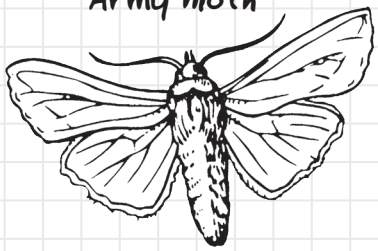
   c. Have one pair of antennae

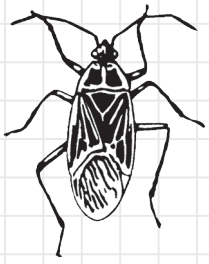
   d. Are the only arthropods with wings.

Swallowtail Butterfly



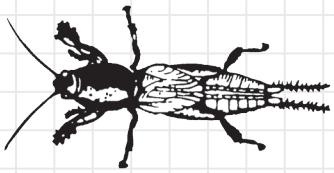
Army Moth

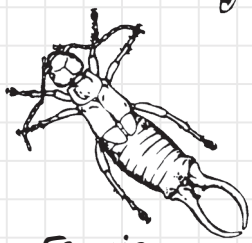




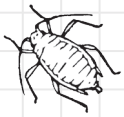
Boxelder Bug

Mole Cricket





Earwig



Aphid

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The phylum Arthropoda, Class Insecta are small animals which:

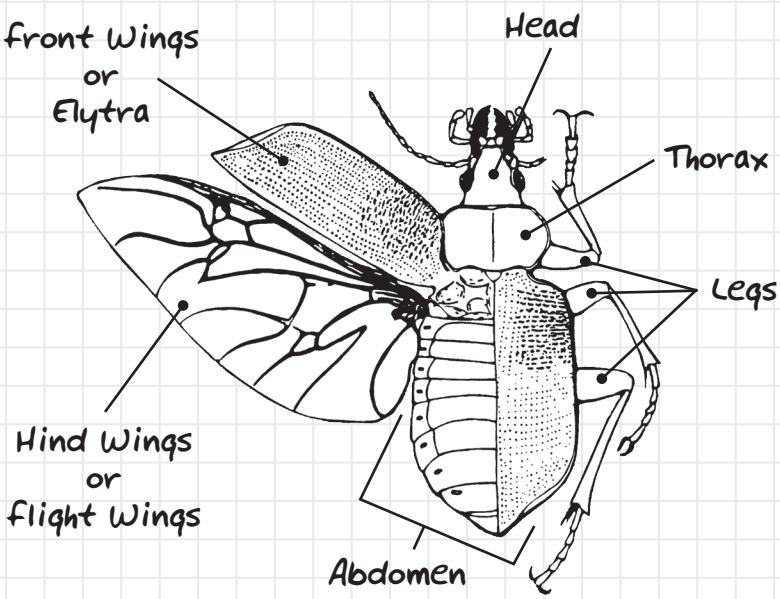
1. Have an exoskeleton (hard covering) on the outside of the body. This gives insects protection. Most animals have skeletons (bones) inside their bodies.
2. Have three body regions. The head holds the eyes, mouth parts, and antenna or feelers. The thorax is the middle part with the legs and wings attached. The abdomen is the part behind the thorax and contains the organs of digestion and reproduction.
3. Have six legs (three pairs). One pair is attached to each segment of the thorax.
4. Have 2 pairs of wings. Other arthropods, like centipedes and millipedes, have 2 antennae.

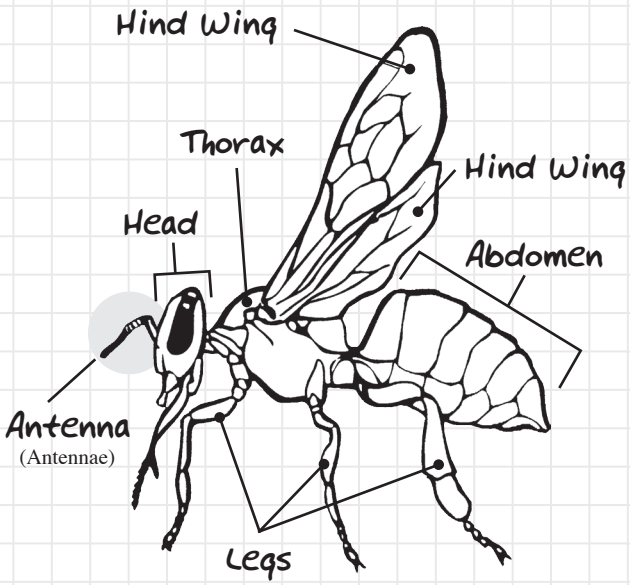
**Note: Evolution has caused some insects, like fleas and ticks, to lose their wings due to a parasitic lifestyle.*

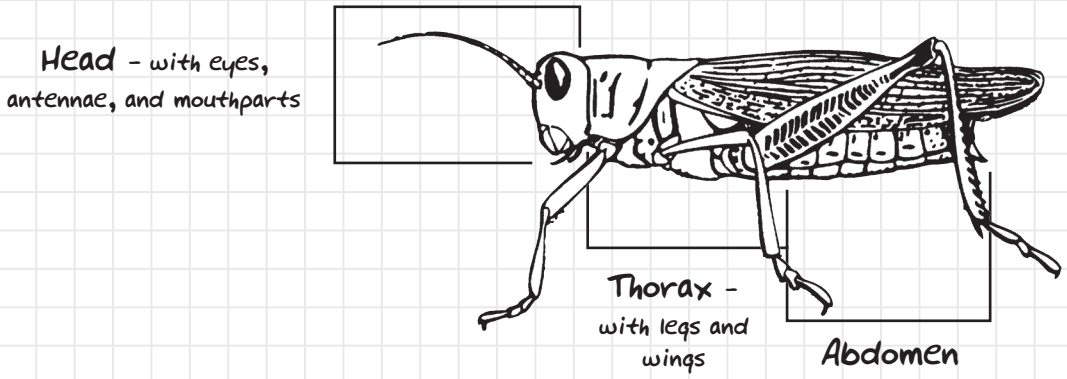
Questions to Consider

- How do we classify other animals?
- Think of those features that make:
  - Horses different from turtles
  - Horses the same as dogs
  - Birds different from frogs

Parts of an Insect







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Insect Biology (SOL: 4.5, 7.5)

Where an insect lives, what it eats, what its habits are, and how it reproduces are all questions of insect biology. Most of them can be answered by a study of the insect's life cycle.

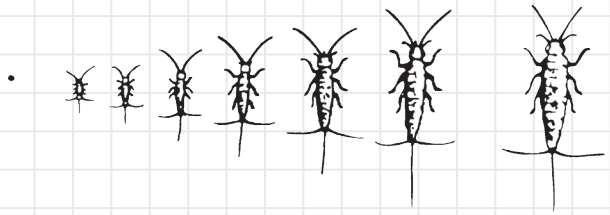
The life cycle of an insect is from the egg stage to the reproducing adult stage. How and what it does during this period is its biology. Metamorphosis is the change in structure and shape that an insect goes through as it grows from egg to adult. Insects are divided into four groups, depending upon their method of metamorphosis.

Questions to Consider

- Think about the life cycle of other animals.
- What are the life stages of frogs, birds, cats, snakes?
- What kind of metamorphosis does each of those have?

Group 1 insects all come from the egg looking exactly like adults, except for size.

Without Metamorphosis



Orders

Thysanura (Silverfish)
Collembola (Springtails)
Mallophaga (Biting lice)
Anoplura (Sucking lice)

Group 2 insects change shape gradually. They have three stages of growth; egg, nymph, and adult.

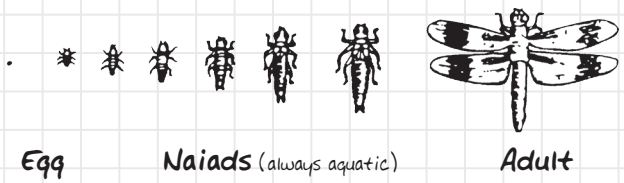
Gradual Metamorphosis

Orders

Orthoptera (Grasshoppers)
Isoptera (Termites)
Psocoptera (Book lice and bark lice)
Thysanoptera (Thrips)
Hemiptera (True bugs)
Homoptera (Aphids, leafhoppers)
Dermaptra (Earwigs)

Group 3 insects change shape gradually. The young do not look like adults until they shed their last exoskeleton. Then there is a quick change.

Incomplete Metamorphosis

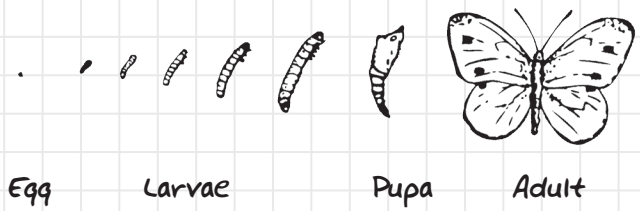


Orders

Ephemerida (Mayflies)
Odonata (Dragonflies)
Plecoptra (Stonefiles)

Group 4 insects all go through four stages of growth; egg, larva, pupa, and adult. None of the young look like the adult. They go through a great change in shape during the pupal stage.

Complete Metamorphosis



Orders

Neuroptera (Lacewings)
Coleoptera (Beetles)
Strepsiptera (Twisted wing parasite)
Mecoptera (Scorpionflies)
Trichoptera (Caddisflies)
Lepidoptera (Moths, butterflies)
Diptera (Flies)
Siphonaptera (Fleas)
Hymenoptera (Bees, wasps)

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Where to Look for Insects (SOL: 4.1, 4.5, 7.4, 7.12)

- In the air for flying insects on warm days from early spring to late fall
- On a wide variety of vegetation, both day and night
- Around street lights, porch lights, and study lamps at night
- In woodpiles, especially in spring and early summer
- In the soil
- On (or in) fresh or decaying fruit
- On domestic animals for parasitic insects such as fleas and lice
- Along the edges of rivers, streams, lakes, and ponds and in the water
- In buildings: around windows or in flour bins, cereal packages, and closets or boxes where clothing and old papers are stored

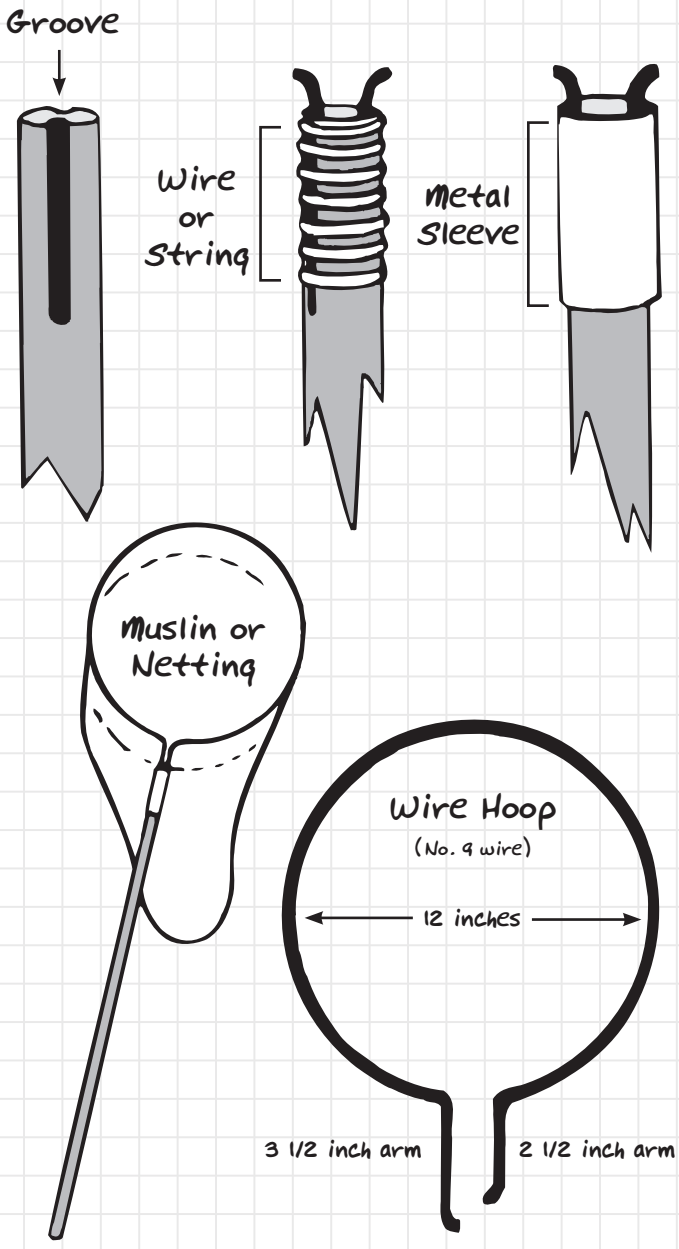
Collecting Net

Materials needed:

1. Small wood handle 3 feet long (broom handle or dowel).
2. About 5 feet of heavy-gauge (No. 9) wire for the hoop.
3. A piece of unbleached muslin or netting cut into two 30-by-20-inch pieces.
4. Soft wire, heavy string, or metal sleeve to hold the hoop's wire to the net handle.
5. Needle and heavy thread.

How to make:

1. Bend the heavy wire into a circle (about 12 inches in diameter) to form a hoop. Bend arms 2-1/2 inches and 3-1/2 inches long to fit in the net handle.
2. Bore holes in the net handle for the arm hooks. If you want a smooth fit, groove the handle on both sides as shown.
3. See "Net Bag Construction" for instructions on how to make a bag.
4. Thread the wire hoop through the hem of the bag and insert wire arms into the handle. Slip the metal sleeve over the handle to hold the wire arms in place. If preferred, you may attach the hoop arms to the net handle by wrapping them with soft wire or heavy string or purchase a net from BioQuip (*www.bioquip.com*) over the Internet.



Insert Insect Net (Muslin or Netting) and Wire Hoop

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Net Bag Construction

To construct the net bag, lay a 20-by-30 inch piece of net material (muslin or netting) on another piece of the same size (Fig A) and fold them making the folded material 10 by 30 inches (Fig. B). Cut the material from the bottom folded corner diagonally up and across to a point 10 inches below the top unfolded corner (Fig. C). After cutting, you will have two roughly triangular pieces (Fig. D).

Stitch the two triangular pieces together, making the seam about 1/2 inch from the cut edge and leave 10 inches free on one side at the top where the net hoop will be inserted (Fig. E). Turn the cut edges inside and stitch the seam down flat (A felled seam).

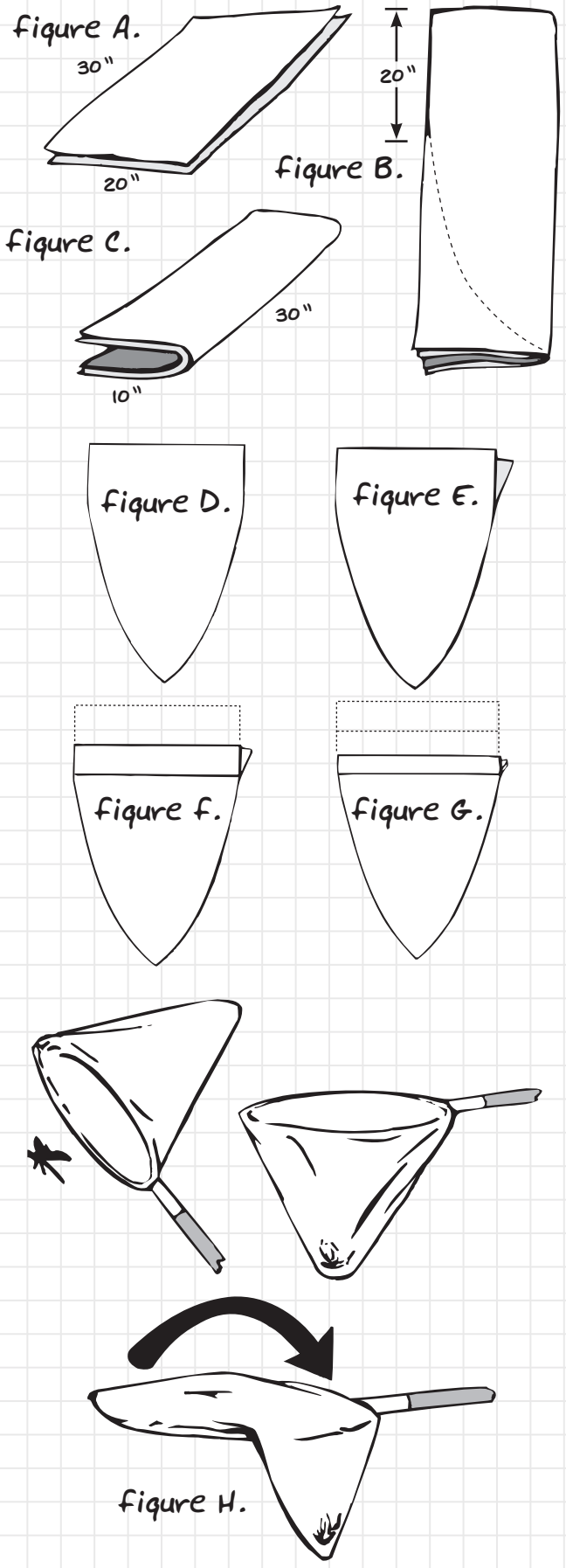
To make a casing for the wire hoop, fold the top edge down 5 inches (Fig F). Then turn the folded edge down 2.5 inches and stitch the hem (Fig G). If you want to reinforce the hem of a bag made of netting, you can make only one fold and cover the fold with a strip of muslin 5 by 40 inches. Then fold again and stitch. The muslin will protect the netting around the wire hoop.

How to Collect Insects with a Net

There is a special technique used to net certain insects, especially stinging and "biting" insects like wasps, bees, hornets, assassin bugs, and tiger beetles. Sweep the insect into the net and with a quick jerk force it to the bottom of the bag. Flip the net hoop over so that the bag lies flat over the hoop. This prevents the insect from FLYING OUT. Then grasp one hand around the bag just above the captured insect. Insert the end of the bag along with the captured insect into the killing jar. Place the jar lid over the mouth of the jar as tightly as possible and hold it for 30 to 60 seconds until the insect becomes motionless. Remove the end of the net from the killing jar and put the stunned insect back in the killing jar. Always stand sideways to the wind while opening and handling your killing jar.

Collecting butterflies and moths without damaging the specimen also requires a special technique and care in handling the net. To prevent butterflies or moths from escaping after being netted, whip the net so the insect goes to the bottom of the bag. Then squeeze the thorax of the butterfly between your thumb and forefinger while it still is in the net. This will stun the insect and prevent it from beating the scales off its wings when it is dropped in the killing jar.

Many kinds of insects "play possum" and become inactive when disturbed. To catch these insects, hold your net under plants and shake the insects off into the net, then transfer them into the killing jar.



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Make an Insect Killing Jar

The size jar depends on the size and kind of insect you want to collect. For butterflies and moths, a glass, wide-mouth pint mayonnaise or pickle jar with a screw cap is satisfactory. Never mix other insects in the same killing jar as your butterflies and moths. They can be easily damaged by beetles, wasps, and other hardier insects. You can use a smaller wide-mouth jar for collecting other insects. Make several jars at a time so that you will always have extras if they get broken.

Preparing the Killing Jar

Materials Needed:

1. Several wide-mouth or canning jars with tight fitting lids.
2. Plaster of Paris
3. Water
4. Ethyl acetate, fingernail polish remover, or other material that contains acetone.

Mix 8 heaping teaspoons of Plaster of Paris with 5 teaspoons of water in a mixing cup. This should make a paste about as thick as a milk shake. Stir the mixture until smooth. Poor or spoon enough mixture into each jar to form a layer 3/4 inch to 1 inch thick. Tap the killing jars against the ground so the Plaster of Paris makes a smooth surface. With the caps off the jars, let the Plaster of Paris set for several days until it is thoroughly dry. When dry, the Plaster of Paris becomes paper white. When the Plaster of Paris is thoroughly set, pour as much killing agent into the killing jar as will be absorbed by the Plaster of Paris. Pour any excess liquid that is not absorbed out onto a concrete surface outdoors and cap the jar immediately. Never pour it into a water source or down a drain. It evaporates quickly off of surfaces like concrete or asphalt. To reduce the danger of inhaling the fumes, go outdoors to "charge" a killing jar. Always keep the jar tightly covered except when placing insects in the jar or taking them out, as the killing agent evaporates very rapidly.

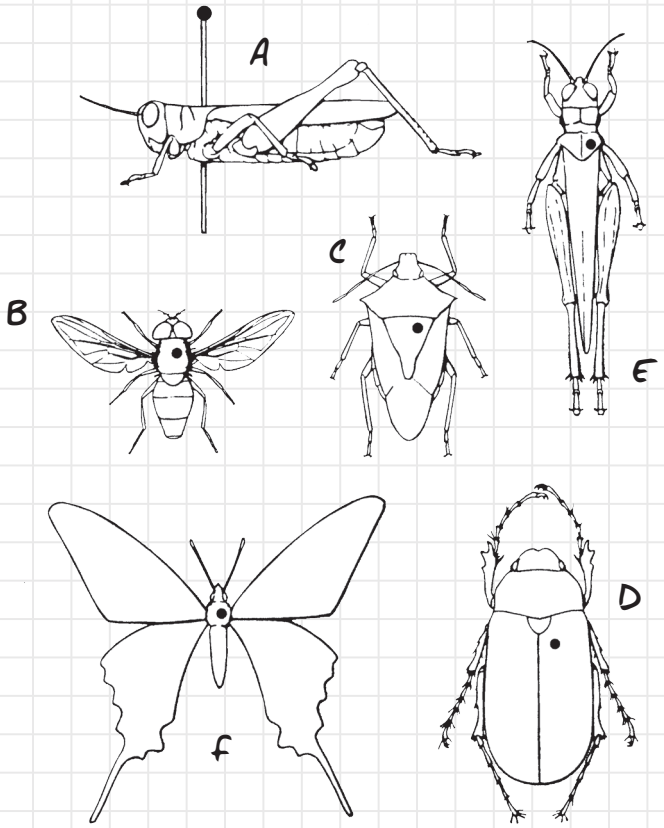
Pinning Insects

You can buy insect pins at most college or university bookstores. Check with your local 4-H leader or on the Internet for the nearest source of supply. Do not use common pins since they will rust and ruin what may be valuable specimens. Insect pins are made of nylon or stainless steel and come in several sizes, but No. 3 and No. 5 are the most useful.

Any insect that is large enough to be pinned without breaking or otherwise being distorted may be pinned directly through the body. The place of insertion depends upon the type of insect. If you use the following rules, you will pin the different types of insects so that the pin is placed firmly through the heavier parts of the body.

1. Bees, wasps, flies, etc.: Pin through the thorax between bases of fore wings and just to right of center line (B).
2. True bugs: Pin through the scutellum, the triangular area between the bases of the wings C.
3. Beetles: Pin through the fore part of the right wing cover near the center line (D).
4. Grasshoppers, crickets, etc.: Pin through the prothorax or "saddle," just to the right of the center line (E).
5. Butterflies, moths, dragonflies, etc.: Pin through center of thorax between the bases of fore wings (F).

Make sure 3/8 inch of the pin projects above the insect to make it easier to handle the specimen. Use a pinning block to measure this distance.



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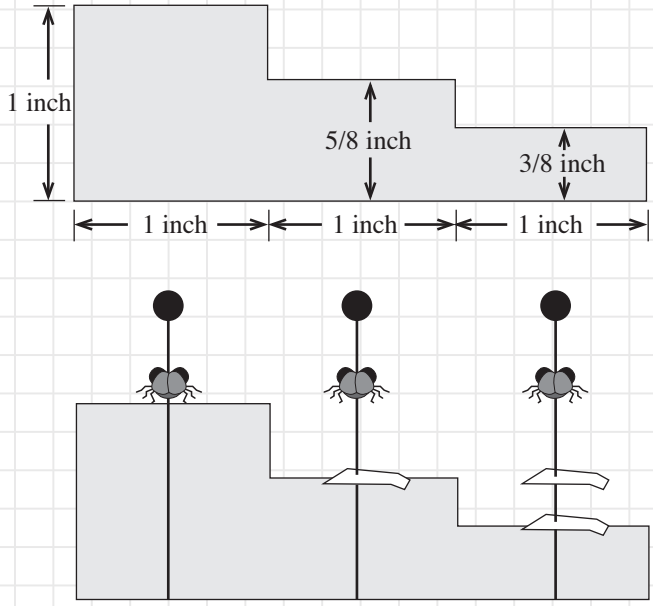
Make a Pinning Block

Pin medium and larger-size insects vertically through the body, using the pinning block to set the height of the insect on the pin. You can make a simple, temporary pinning block out of corrugated cardboard. You can make a more permanent pinning block out of wood. Position bug first at the highest level. Insert pin in the insect at the correct position. Once the insect is positioned, move pin and insect to second level and pin through the first label containing collection information. Move the pin holding insect and first label to the third level and pin through the second label, the one that identifies the insect. See diagram on page 12.



Adjusting Height of Insect and Labels on PIn

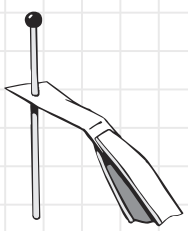
How to Card Point Small Insects

1. Select some heavy paper, such as index cards, for making the card points.

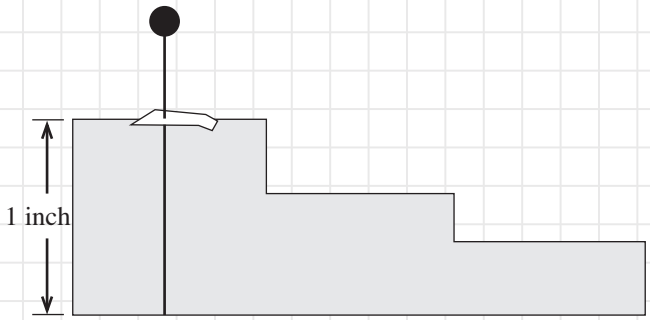
A Card Point (actual size)

2. Cut the card points in the shape shown and about 3/8 inch long.

3. Put a pin through the base of the card point as shown and push it up on the pin to about 1/4 inch from the top of the pin. Use a pinning block to set the card points at uniform heights.

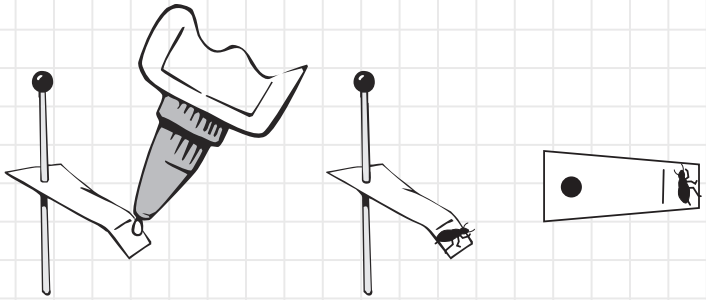


4. With a pair of tweezers, bend the tip of the card point down as shown in the sketch.



Adjusting Height of Card Point

5. Put a tiny drop of glue on the bent-down part of the card point. Press it gently to the underneath, right side of the insect. You can use clear fingernail polish or any clear-drying glue. Be sure the insects is "square with the world" and not at an angle. This takes practice!



Block Spreading Board

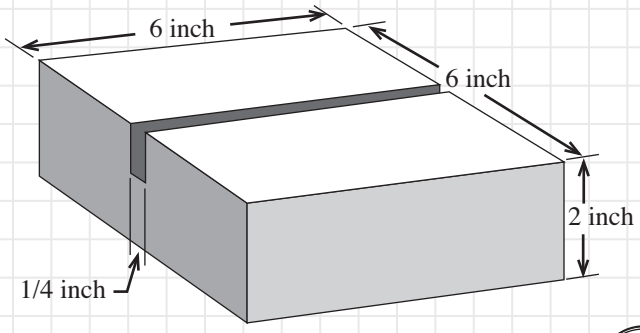
Materials needed:

1. Block of soft wood (balsa wood) or Styrofoam approximately 6 x 6 x 2 inches.

2. A handsaw or pocketknife

How to make:

Saw or cut a wide groove across the block. The groove should be about 1/4 inch wide and 1/2 inch deep. This makes a slot for the insect's body to rest in when spreading the wings. You may wish to make three or four of these blocks (some with broad and some with narrow slots) for spreading small or large butterflies or moths.



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Spreading Butterfly Wings

A. Put an insect pin through the center of the thorax of a freshly killed butterfly. (If the insect has dried, see your leader for instructions for relaxing specimens.) Leave ¼ inch of the pin exposed above the thorax. Make sure the insect does not tip from side to side or front to back on the pin.

B. Push the pin straight down in the center of the slot of your pinning board until the outstretched wings are just level with the surface of the pinning board.

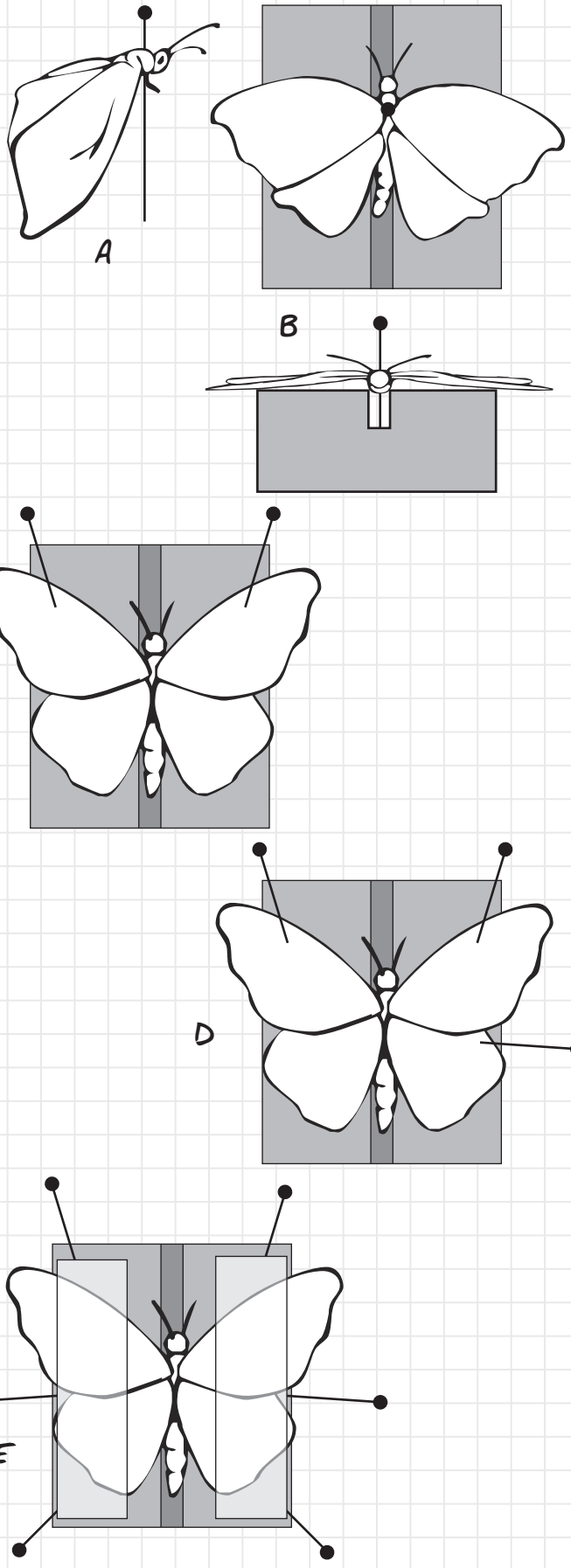
C. Lightly insert an insect pin in each front wing along the front margin and just behind one of the heavy wing veins. Move the front wings, using the pin, gently forward until the hind margins of the front wings are in a straight line at right angles to the body. Push pins gently into block to hold the wings.

D. With a pin placed behind a heavy vein in the hind wing, move each hind wing forward until the gap between the front wing and hind wing is closed to just a notch, as shown in the right side of D.

E. Cut some narrow strips of paper and lay them over the wings. Pin them in place as shown. Remove the other pins that are through the wings. The pins holding the paper strips in place should not go through the wings but should be close to them to keep enough pressure on the wings to prevent them from slipping out of place. Some entomologists use transparent paper so they can see if the wings have slipped out of place while the specimen is drying. Too thin paper will not give enough pressure on the wings. If the abdomen tends to sag, you can prop it up with pins until it dries.

You also can use pins to keep the antennae in place while the specimen dries. Depending on the moisture in the air, the specimen should remain on the board from four to eight days,

Note: As you gain more practice with spreading butterflies, you will want to use a method which does not puncture the wings with pins. This method is shown in some entomology books.



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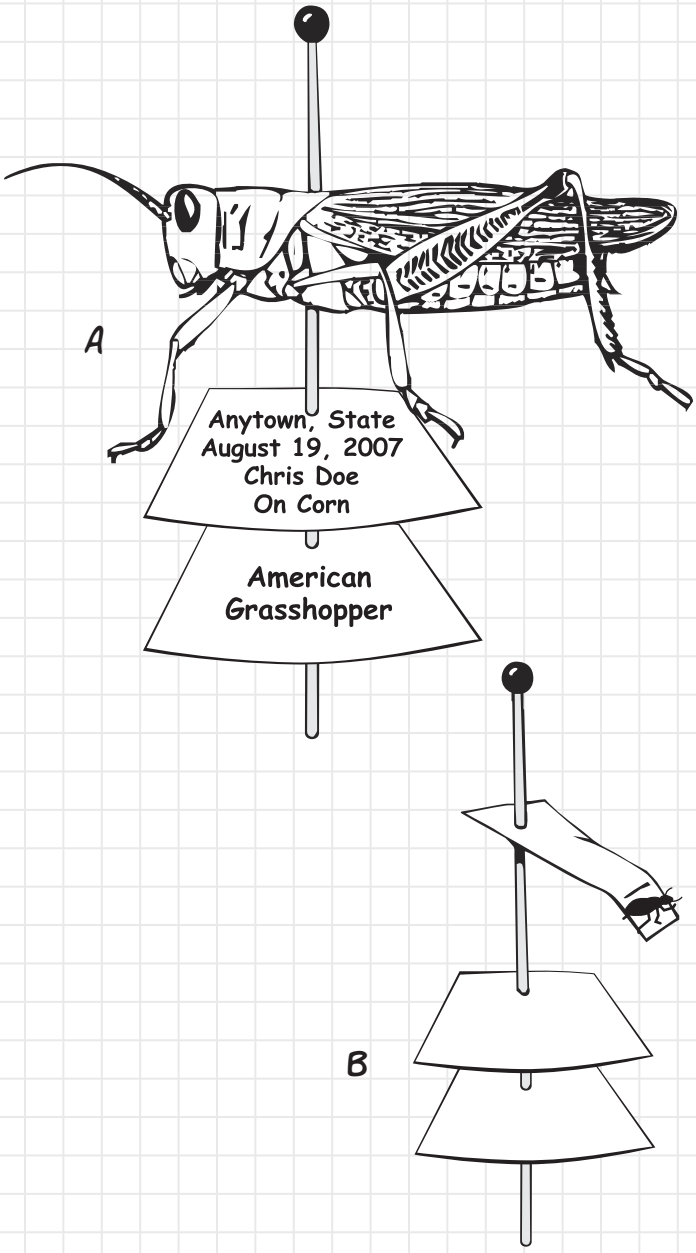
Labeling Insects

(a) Shows information on each label.

(b) Shows proper arrangement on pin.

(There are no sheets in back, use labels page 45). The most important label is the one that tells where, when, and by whom the insect was collected. Every pinned insect should have this label. Remember, a specimen without a date, locality, and collector label is practically worthless. You can add the "common name" labels if you know this information. Place labels at the desired height on the pin by means of a pinning block.



Making a Collection Box

Materials:

1. Any sturdy shallow box about 2 by 6 by 8 inches, similar to a cigar box, which is ideal
2. Piece of corrugated cardboard, soft fiberboard, or Styrofoam
3. Glue
4. Moth crystals to keep pests out of collections
5. Pill box or safety-match box to hold moth crystals
6. No. 2 and No. 3 insect pins
7. Insect labels
8. White paper

Procedure:

1. Cut the cardboard, fiber board, or Styrofoam to fit the bottom of the box.
2. Smear glue on bottom of box and insert cut piece.
3. Line the box with white paper.
4. Fill a safety-match or small pill box with moth crystals (crushed mothballs).
5. If the pill box is air tight, punch some holes in the lid.
6. Pin the crystals box in a corner of the collection box.

Questions to Consider

- Why do people collect insects?
- Why do you want to collect insects?
- Why do people collect other things?
- What do they collect?
- How do they display them?

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Identifying Your Insects (SOL: 7.5, 6.1)

Each insect you collect will belong in a particular Order. This is the system used in grouping insects. From the description given of the Orders and the illustrations shown, place your insects in the Orders in which they belong.

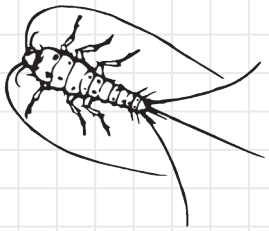
Thysanura (Firebrats, Silverfish)

Wings: None

Mouthparts: Chewing

Metamorphosis: None

Silverfish



Added note: Silver-colored insects with long antennae and two or three long antennae-like appendages (cerci) at the end of the abdomen. The silverfish feed on rayons, starched clothes, book bindings, and other materials having starch or glue. Most damage is caused to paper products. Can be found in feed or flour mills where starchy foods are handled or in sinks and bathtubs of homes.

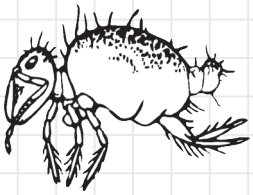
Collembola (Springtails)

Wings: None

Mouthparts: Chewing

Metamorphosis: None

Springtail



Added note: Very small insects, less than 1/5 inch long. Flip themselves into the air by means of a spring-like appendage, under the abdomen. Found in damp places such as under decaying vegetation, stones, boards, and in the soil.

Orthoptera (Grasshoppers, Crickets, Cockroaches. Mantids)

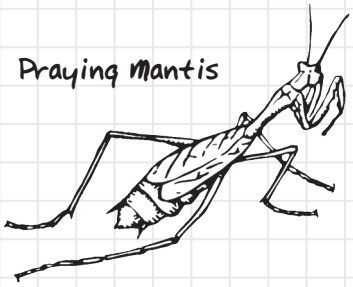
Wings: Top pair – Leathery; Bottom pair – Membranous and folded under top pair (camel crickets are wingless)

Mouthparts: Chewing

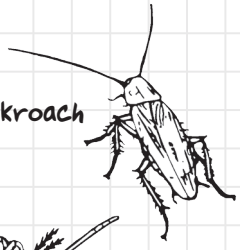
Metamorphosis: Gradual

Added note: A very common order of insects.

Praying Mantis

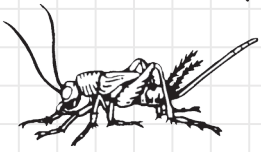


Cockroach



Red-legged Grasshopper

Field Cricket



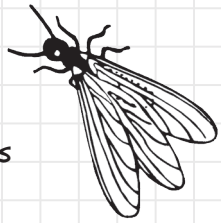
Isoptera (Termites)

Wings: Two pairs of the same length (workers are wingless)

Mouthparts: Chewing

Metamorphosis: Gradual

Termites



Added note: Kings and queens may be collected while swarming and workers may be found infesting wood. Look under wood on the ground.

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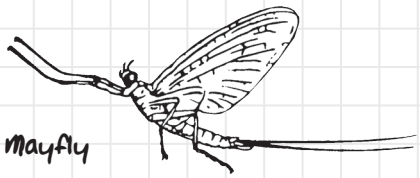
Ephemeroptera (Mayflies)



Wings: Two pairs – First pair much larger than second pair.

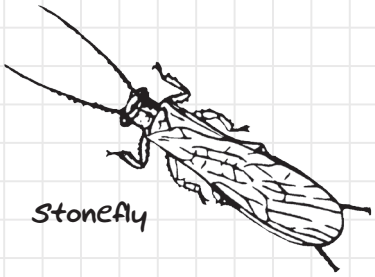
Held vertically when at rest.

Mouthparts: None

Metamorphosis: Incomplete

Added note: Found near water and attracted to lights. Have two or three long antennae-like appendages (cerci) at the end of the abdomen. Niads are aquatic.

Plecoptera (Stoneflies)



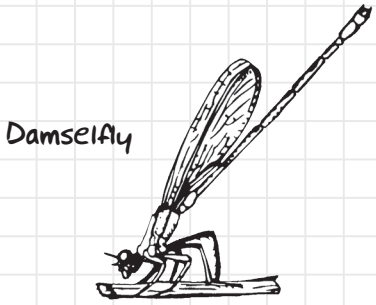
Wings: Two pairs

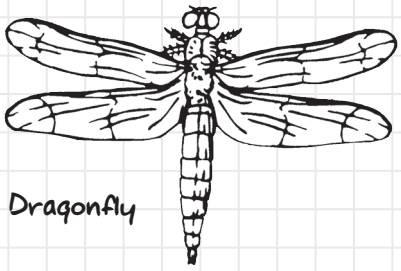
Mouthparts: Chewing

Metamorphosis: Incomplete

Added note: Found near running streams.

Odonata (Dragonflies, Damselflies)





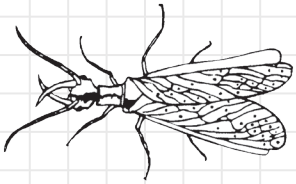
Wings: Two pair

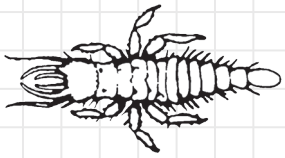
Mouthparts: Chewing

Metamorphosis: Incomplete

Added note: Feed on other insects.
Usually found near water. Niads are aquatic.

Neuroptera (Dobsonflies, Lacewings, Ant lions)





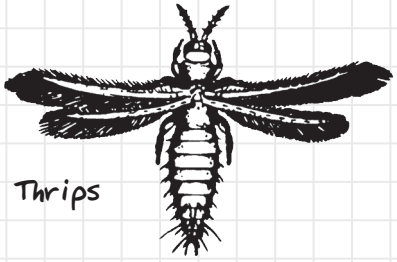
Wings: Two pairs, many fine net-like veins

Mouthparts: Chewing

Metamorphosis: Complete

Added note: Have long antennae and are predators. Seen at lights at night where they feed on other insects. Antlions are immature and make pits in the ground to entrap prey.

Thysanoptera (Thrips)



Wings: Two pairs or none

Mouthparts: Rasping, sucking

Metamorphosis: Gradual

Added note: Very small insects, 1/8 inch long or less. Feed on many plants.

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Psocoptera (Book and Bark lice)

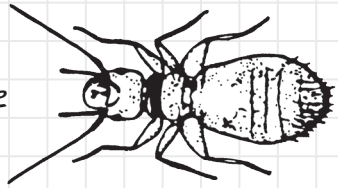
Wings: Some wingless, some with two pairs

Mouthparts: Chewing

Metamorphosis: Gradual

Added note: Found in old books and papers or on bark of trees or damp, stored grain.

Book Lice



Trichoptera (Caddisflies)

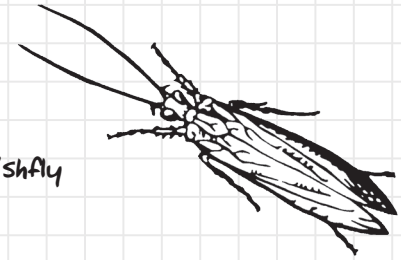
Wings: Two pairs

Mouthparts: Chewing

Metamorphosis: Complete

Added note: Wings covered with short hairs and held roof-like over body when at rest. Found near water. Larvae are aquatic. They do not have niads because they have complete metamorphosis.

Caddisfly



Mallophaga (Chewing lice)

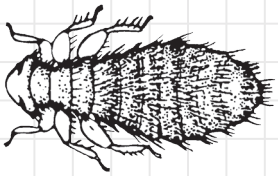
Wings: None

Mouthparts: Chewing

Metamorphosis: None

Added note: Live on birds and to some extent on mammals. Feed on hair, feathers, scales, and dried blood.

Large Chicken Louse



Anoplura (Sucking Lice)

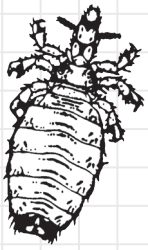
Wings: None

Mouthparts: Piercing, sucking

Metamorphosis: None

Added note: Head narrow and long. Claws pincer-like for grasping hairs. Feed on mammals. Also like hogs, but let's tell it like it is.

Human Body Louse



Dermaptera (Earwings)

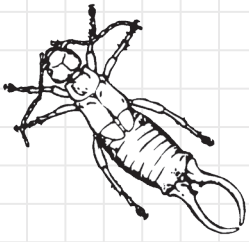
Wings: Two pairs

Mouthparts: Chewing

Metamorphosis: Graduate

Added note: Front pair of wings like those of beetles but very short, hind pair membranous. Have a pair of pincers on end of abdomen. Found on plants and decayed matter and in damp locations in houses.

Earwig



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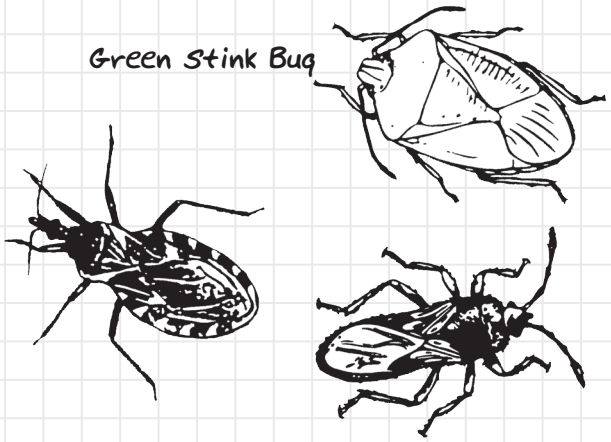
Hemiptera (True Bugs)

Wings: Two pairs – front pair is half leathery and half membranous and hind pair is membranous.

Mouthparts: Piercing, sucking

Metamorphosis: Gradual

Added note: Most live on land but a few live in the water. Most feed on plant juices, but there are some that feed on animals and others that feed on other insects.



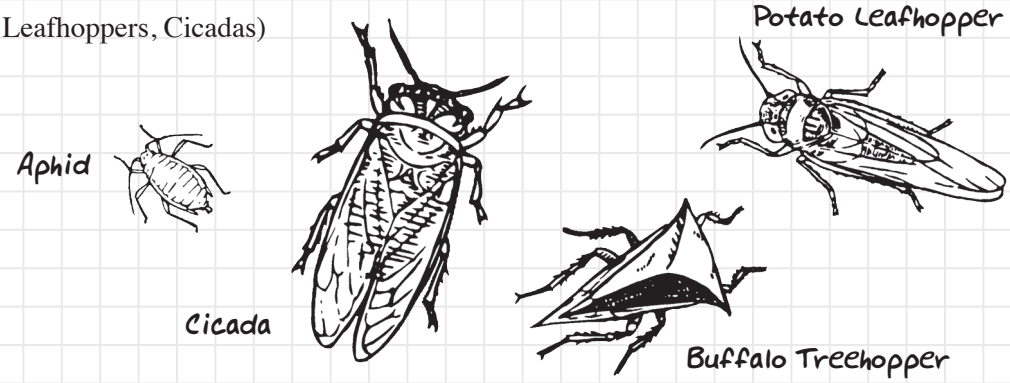
Homptera (Aphids, Scales, Leafhoppers, Cicadas)

Wings: Two pairs or wingless

Mouthparts: Piercing, sucking

Metamorphosis: Gradual

Added note: All feed on plants.



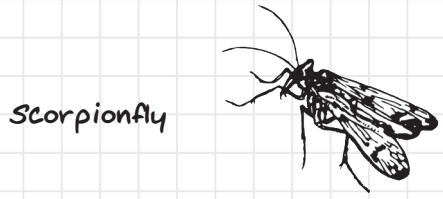
Mecoptera (Scorpionflies)

Wings: Two pairs, long and narrow

Mouthparts: Chewing

Metamorphosis: Complete

Added note: Mouthparts arevat the end of a long snout. Found on low vegetation in dense woods or sometimes in open fields.



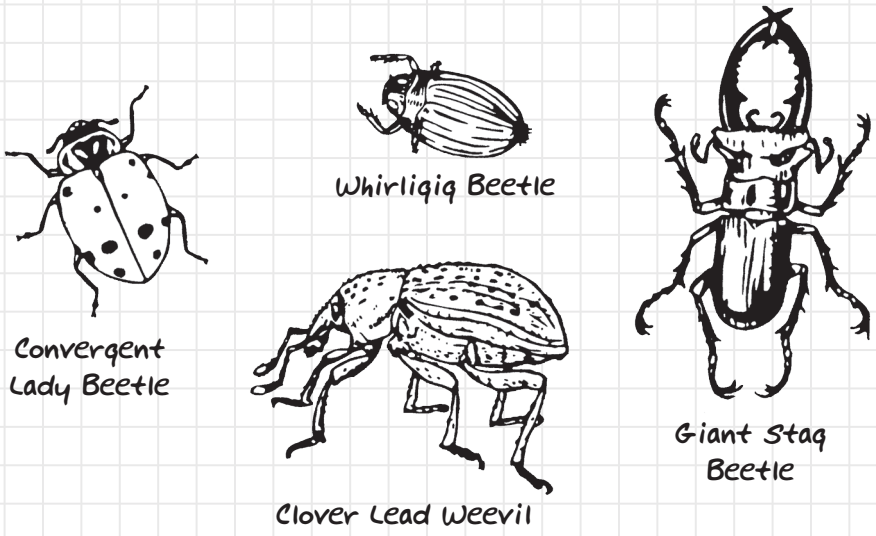
Coleptera (Beetles)

Wings: Two pairs – front pair is hard and shell-like, and hind pair is membranous

Mouthparts: Chewing

Metamorphosis: Complete

Added note: This is one of the largest orders of insects in the world and is found almost everywhere.



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Siphonaptera (Fleas)

Wings: None

Mouthparts: Piercing, sucking

Metamorphosis: Complete

Added note: Adults live on animals. Fleas on pets lay eggs that drop off the animal and onto the floor. The larvae hatch and can live in the carpet fibers feeding on dried blood until they pupate.

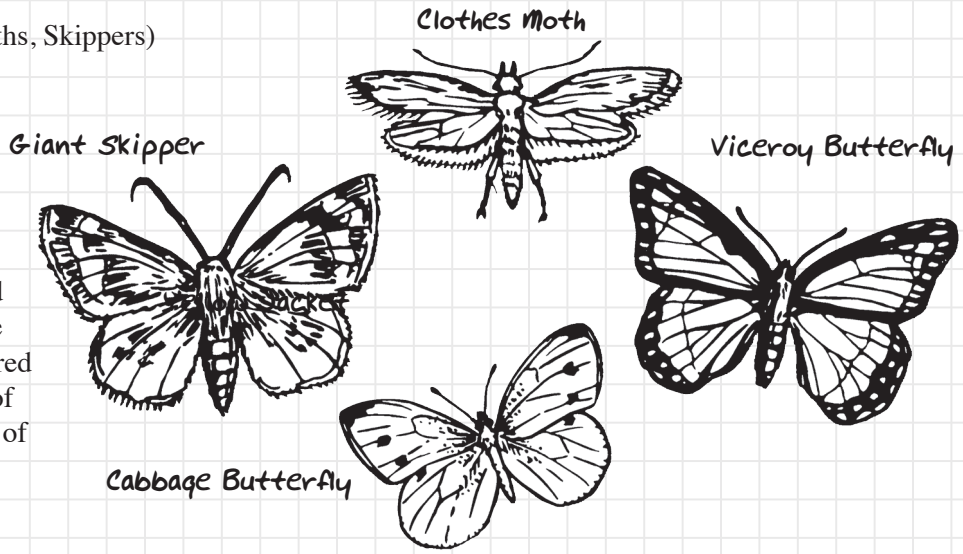
Lepidoptera (Butterflies, Moths, Skippers)

Wings: Two pairs

Mouthparts: Siphoning

Metamorphosis: Complete

Added note: Moths hide during day and are active at night. Butterflies are active in the day and are usually brighter colored than the moths. Skippers have the tips of the antennae bent back like the handles of walking canes.



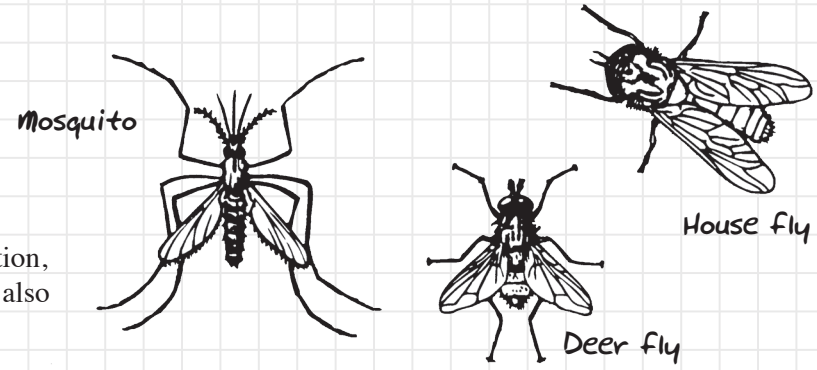
Diptera (Flies, Mosquitoes, Midges)

Wings: One pair

Mouthparts: Piercing, sucking, or sponging

Metamorphosis: Complete

Added note: Found around flowers, decaying vegetation, on animals, and in houses and barns. Many bite, and also breed in filth and waste.



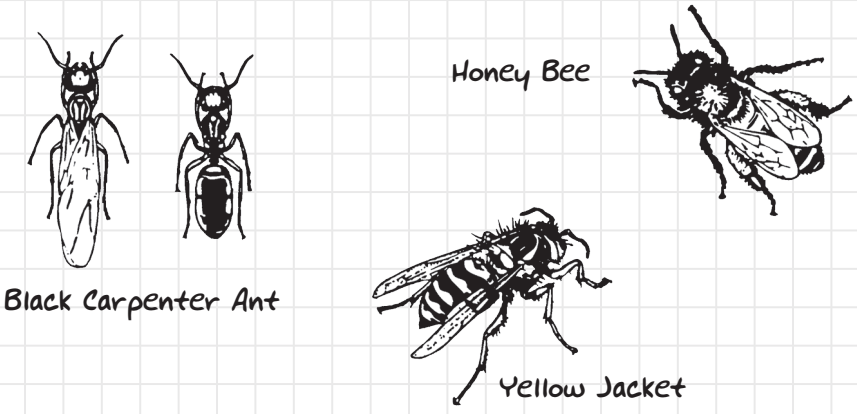
Hymenoptera (Bees, Wasps, Ants)

Wings: Two pairs. Worker ants are wingless.

Mouthparts: Chewing

Metamorphosis: Complete

Added note: The greatest number of insects on earth and found almost everywhere.



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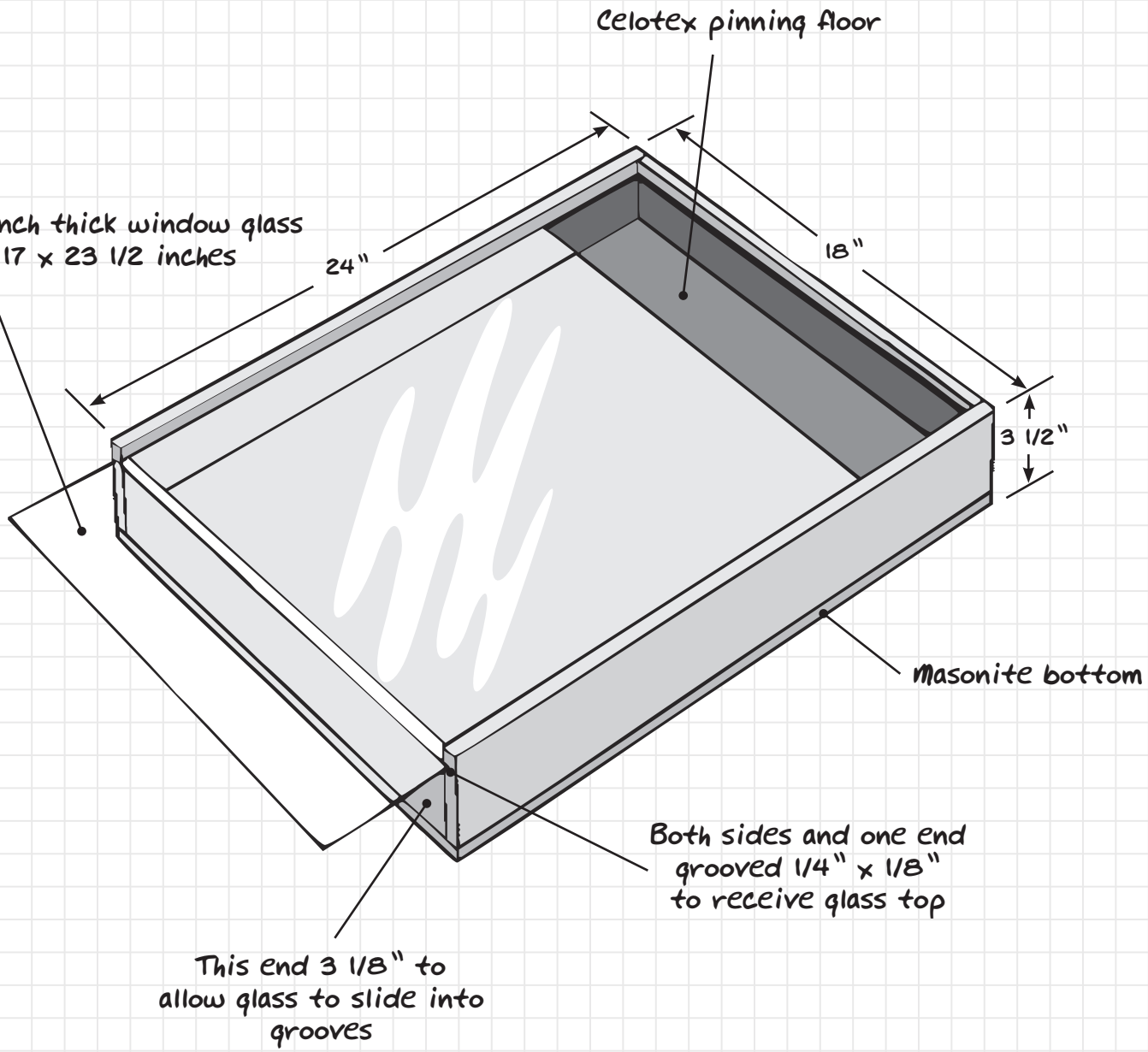
Glass-top Display Case

Materials needed for an 18-by-24-inch glass-top display case:

1. One piece of masonite or hardboard for bottom – 18 x 24 inches.
2. Two side pieces of pine – 3/4 x 3 1/2 x 24 inches.
3. One end piece of pine – 3/4 x 3 1/2 x 16 1/2 inches.
4. One end piece of pine – 3/4 x 3 1/8 x 16 1/2 inches.
5. One piece of Celotex or similar soft fiberboard for the pinning floor – 16 1/2 x 22 1/2 inches.
6. One piece of window glass 1/8 inch thick – 17 x 23 1/2 inches.



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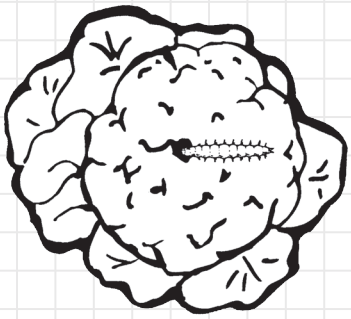
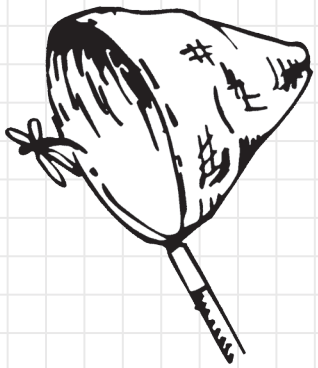
Where to look for Insects?



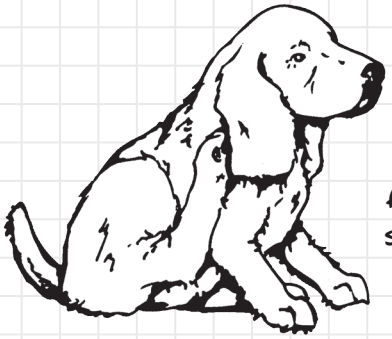
On a wide variety of vegetation, both day and night.



In the air for flying insects on warm days from early spring to late fall.

At night around street lights, porch lights, and study lamps.

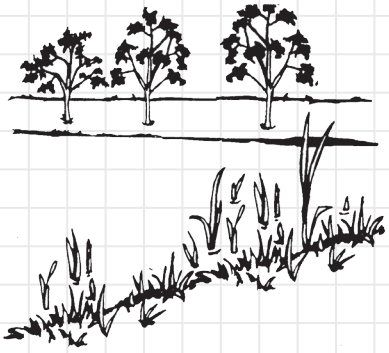
On (or in) fresh, or decaying fruit.



On domestic animals for parasitic insects, such as fleas, and lice.

In woodpiles, especially in spring and early summer.

Along the edges of rivers, streams, lakes, or ponds and in the water.



In the soil.

In buildings – windows, in flour bins, cereal packages, closets or boxes where clothing and old papers are sold.

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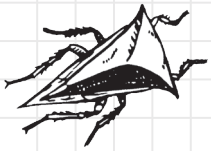
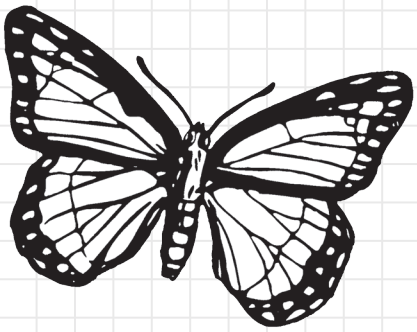
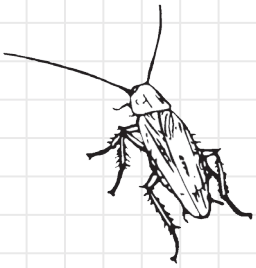
Can you name these insects?

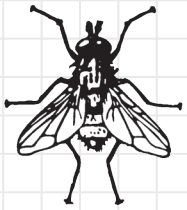
(SOL: 7.5)

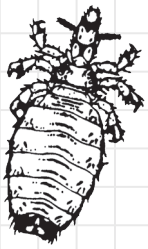


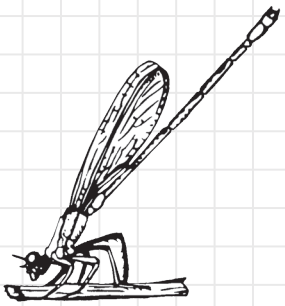




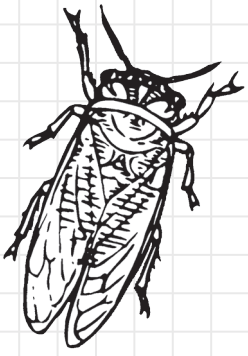
1. _____ **2.** _____ **3.** _____

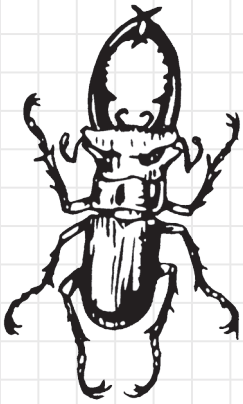


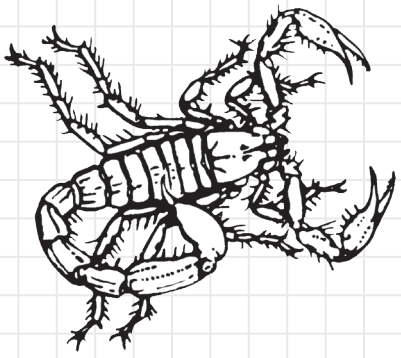




4. _____ **5.** _____ **6.** _____







7. _____ **8.** _____ **8.** _____

1. Buffalo Treehopper; 2. Butterfly; 3. Cockroach; 4. Deer fly; 5. Sucking louse; 6. Damselfly; 7. Cicada; 8. Stag Beetle; 9. Scorpion

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Entomology Project

Sharing What you Did:

1. What did you like about this project?
2. What was the easiest part? The hardest part? The most fun? The most boring?
3. How did you decide which insects to collect? Why did you choose your particular method of display?
4. How did you feel about doing this project?

Processing What's Important:

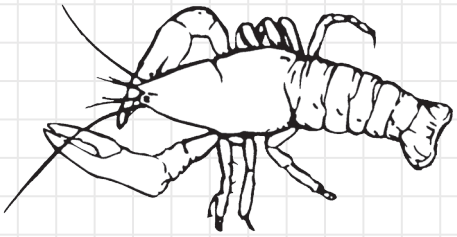
1. Why is it important for you to know and for others to know about insects?
2. What problems occured during the project?
3. What did you learn about making decisions?
4. What type of communication helped you make your decisions?
5. If you worked in a group, what were some common themes or thoughts you heard?

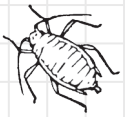
Generalizing "So What?":

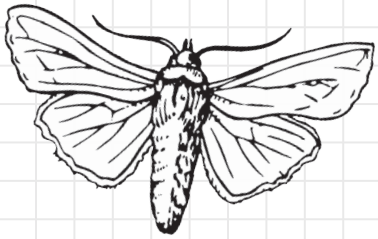
1. How will learning about insects help you?
2. When else have you had similar experiences while learning new things? What about this experience made it a brand new learning experience?
3. What other resources can help you gather information about entomology?
4. What are some ways you like to learn? How did you use them in this project?
5. What did you learn about observation?

Applying What Was Learned to other Situations:

1. How would you teach someone else about arthropods?
2. What did you learn through this project that you will be able to use in school? At home?
3. Describe a time when you might need the skills/ knowledge you learned through this project.
4. In what other ways could you apply the skills learned in this project?
5. What would you do differently if you conducted this project again?







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Add photographs of your project here. Label them and tell why they are important to you.

4-H is a community of young people across America who are learning leadership, citizenship, and life skills.

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