

c. /

3

stp.govs
MN
2000
FHB
43



The INSECTS and YOU



4-H Entomology Project

University of Minnesota ①
Agricultural Extension Service ②
U. S. Department of Agriculture

This archival publication may not reflect current scientific knowledge or recommendations.
Current information available from University of Minnesota Extension: <http://www.extension.umn.edu>

Contents

Objectives	2
4-H Entomology project	3
Who is eligible?	3
What do you do?	3
What is an insect?	4
How do insects grow?	4
How do insects eat?	5
Names of insects.	5
The major orders of insects	6
Adult insect specimen identification charts	
Equipment you'll need.	8
Collecting insects	13
Pinning insects	13
Spreading winged insects	14
Labelling specimens.	15
Arranging specimens	15
Preservation of immature stages	16
Rearing insects	16
Insect control	17
Principles of insect control.	17
Use of insecticides	18
References	19
Insect Record Sheet (4-H Ent. Form #1)	
Life History Study (4-H Ent. Form #2)	

This Book is the Property of: _____

My Address is: _____
My 4-H Club is: _____

Objectives

The purpose of this program is to encourage 4-H boys and girls to:

- 1** Develop leadership talents and work toward achieving the broad objectives of character and effective citizenship.
- 2** Learn the life history and habits of insects and the relation of insects to modern living.
- 3** Learn to recognize major insect pests and beneficial insects common to the area where the club member lives.
- 4** Apply the fundamentals of insect control by carrying on the evaluating insect control practices.
- 5** Learn about insecticides -- the kinds, their specific uses, and safety practices to be followed.
- 6** Apply knowledge of control to other 4-H projects and support community activities related to insect control.

Note to Leaders: Refer to Agricultural Handbook 106, 4-H Club Entomology Leaders Manual. USDA

4-H Entomology Project

This guide has been prepared to aid 4-H Club members in collecting, identifying, and learning more about the insects in Minnesota. In many of our activities insects are our greatest enemies. In order to effectively fight these pests, we must learn all we can about them -- what they are, how they live, where they live, and what they eat. Many insects are helpful. Some pollinate our fruit and field crops, some provide food or other useful materials, and some help us control the harmful insects. We should learn all we can about these helpful insects as well as the harmful kinds.

It is also important to study insects in order to fully appreciate the world of nature around us. We will all lead fuller lives when we are able to recognize our common insects by name instead of simply calling them "bugs".

Some of the activities in which you engage in the Entomology project should eventually become part of other projects. For example, you may include the prevention and control of clothes moths in a clothing project or corn borer control in a crops project. These activities may then become part of your entomology record.

The Entomology project is divided into three units. You should start in Beginner's Unit and progress through Junior and Advanced. It is better to go slow at first and be sure of what you are doing than to skim through too fast.

You will notice that there are some suggested optional studies in addition to the minimum requirements. You can go as far as you wish in entomology. Be sure to record all your activities in the Entomology Record.

Who is Eligible?

Any one who is eligible to be a 4-H Club member is eligible for the Entomology Project. See your Club Leader or County Extension Agent about enrollment.

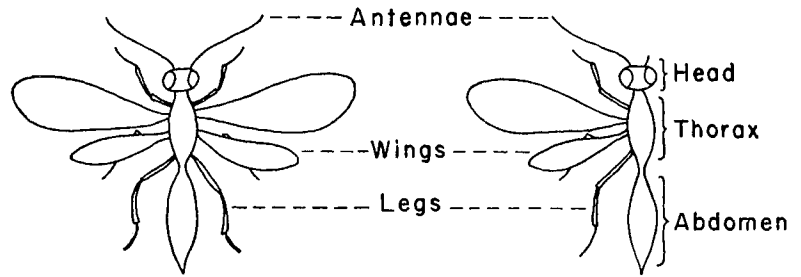
What Do You Do?

In addition to the minimum requirements you will be expected to:

- ➔ Attend local club meetings and, if possible, county and state events.
- ➔ Keep accurate 4-H records of your progress and write a story.
- ➔ Appear before your club, when requested, to give talks or demonstrations on entomology.
- ➔ Exhibit your collection and equipment at achievement days, fairs, etc.

What is an Insect?

An insect is a small animal that has its skeleton on the outside of the body. In the adult stage it has three body regions -- the head, thorax, and abdomen. The adult insect has one pair of feelers or antennae on the head, three pairs of legs, and usually one or two pairs of wings. The legs and wings are attached to the thorax.



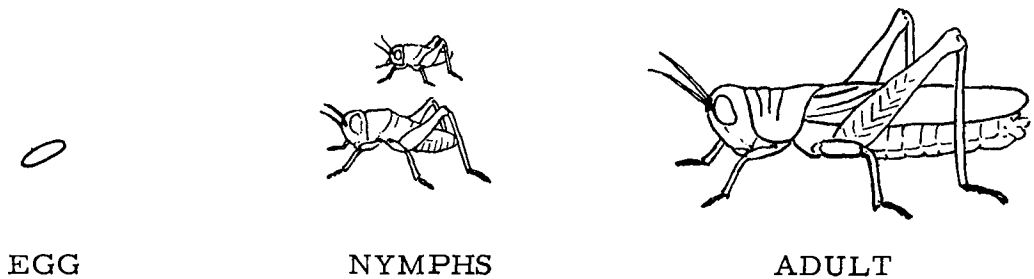
--External construction of an insect.

The legs and wings are attached to the thorax.

How Do Insects Grow?

Insects change from the time they hatch from eggs until they become full grown. Some kinds of insects, like grasshoppers, change gradually. Young grasshoppers look very much like adult 'hoppers. They pass through several growth stages, or instars. Between the instars they shed their skins, or molt. This type of growth is called gradual metamorphosis.

Other insects, like moths and butterflies, change completely from one stage of growth to the next. They go through four distinct stages -- egg, larval (caterpillar), pupal (resting stage), and adult. This type of development is called complete metamorphosis.



Gradual Metamorphosis

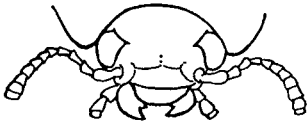


Complete Metamorphosis

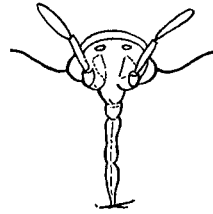
How Do Insects Eat?

Some kinds of insects, like grasshoppers, have chewing mouth parts. These parts are composed of an upper lip (labrum), lower lip (labium), and two pairs of jaws (mandibles and maxillae). These jaws work side ways, or horizontally, instead of vertically like yours.

Other insects, like mosquitoes, have mouth parts which are adapted for sucking liquid food. Some are capable of piercing and some, like the house fly's, are used for lapping liquified food. Some of these insects feed on the sap of plants, others feed on blood from various animals.



CHEWING MOUTH PARTS



SUCKING MOUTH PARTS

Names of Insects

For identification and understanding, insects are divided into groups called orders. These orders are characterized mainly by the wings, mouth parts, and the type of growth. Most of the order names mean something; that is, they more or less describe the insects in that order. You will notice that most of the order names end in "ptera." This part of the name refers to wings and the first part of the name of the order describes these wings. For example, COLEOPTERA -- coleo means sheath or shell; ptera refers to wings. Coleoptera means the shell-winged insects, or beetles.

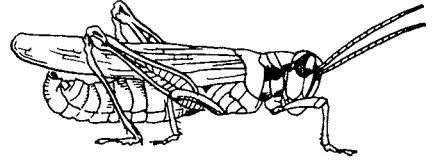
You may have noticed that insects, like plants and birds, have scientific names. These scientific names identify the insect positively and show the relationship between different insects. The scientific name of an insect is the same all over the world. An entomologist in France may not know what we mean by cattle grub or heel fly, but if we say "Hypoderma lineatum" he will know which insect we are talking about. The scientific name is divided into two parts, the genus and the species. The first part, or genus, begins with a capital letter. The species name is not capitalized. When writing the scientific name it is underlined or italicized.

The Major Orders of Insects

The orders described here are the most common ones, and you should soon be able to recognize them. As you advance in the study of insects you may become acquainted with some of the other orders as described in the 4-H Club Insect Manual, USDA Agricultural Handbook #65, or in other references listed at the end of this guide.

Orthoptera (Orthos-straight, pteron-wing)
(Orth - op' - ter - a)

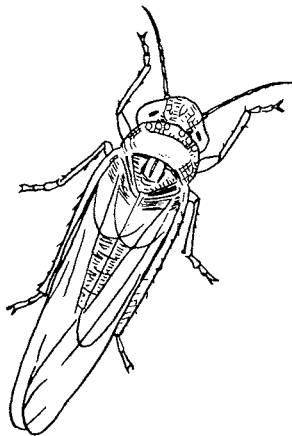
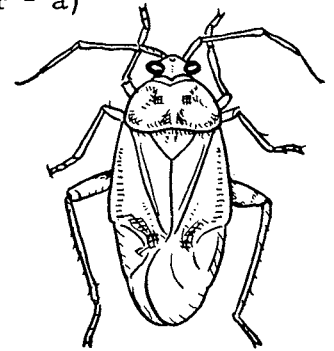
Includes grasshoppers, crickets, katydids, cockroaches, and walking sticks.



Has four wings when present. Front wings are leathery and straight, hind wings folded like a fan. Has chewing mouth parts, gradual metamorphosis.

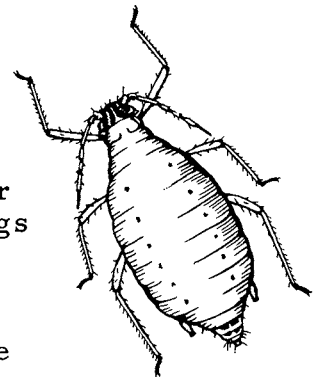
Hemiptera (Hemi-half, pteron-wing) (Hem - ip' - ter - a)

Has four wings when present. Front wings are half leathery (at base) and half membranous or clear. Wings form an "X" on back when folded. Has piercing, sucking mouth parts. Gradual metamorphosis. Some have a strong odor. Includes the true bugs; box elder bugs, chinch bugs, bed bugs, stink bugs, Lygus bugs.



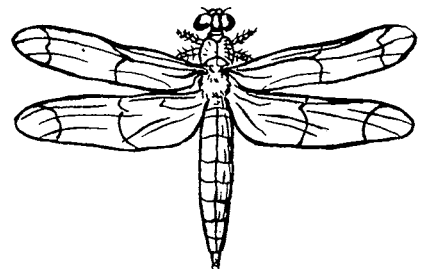
Homoptera (Homo - same, pteron-wing) (Hōm - op' - ter - a)

Has four wings when present; some wingless forms. Front wings are either clear or leathery, longer and narrower than hind wings. Wings fold over the back like a roof. Has piercing, sucking mouth parts. Gradual metamorphosis. Includes aphids, leafhoppers, cicadas, scale insects, tree hoppers.



Odonata (Odous - a tooth) (Ō - don - ā' - tā)

Has four long, narrow, finely netted wings; usually clear, sometimes banded. Wings usually have a slight notch on the front edge. Has very large eyes, head loosely jointed to the thorax, long, slender body. Has chewing mouth parts, an intermediate metamorphosis. Young live in water. Includes dragon flies, damsel flies.

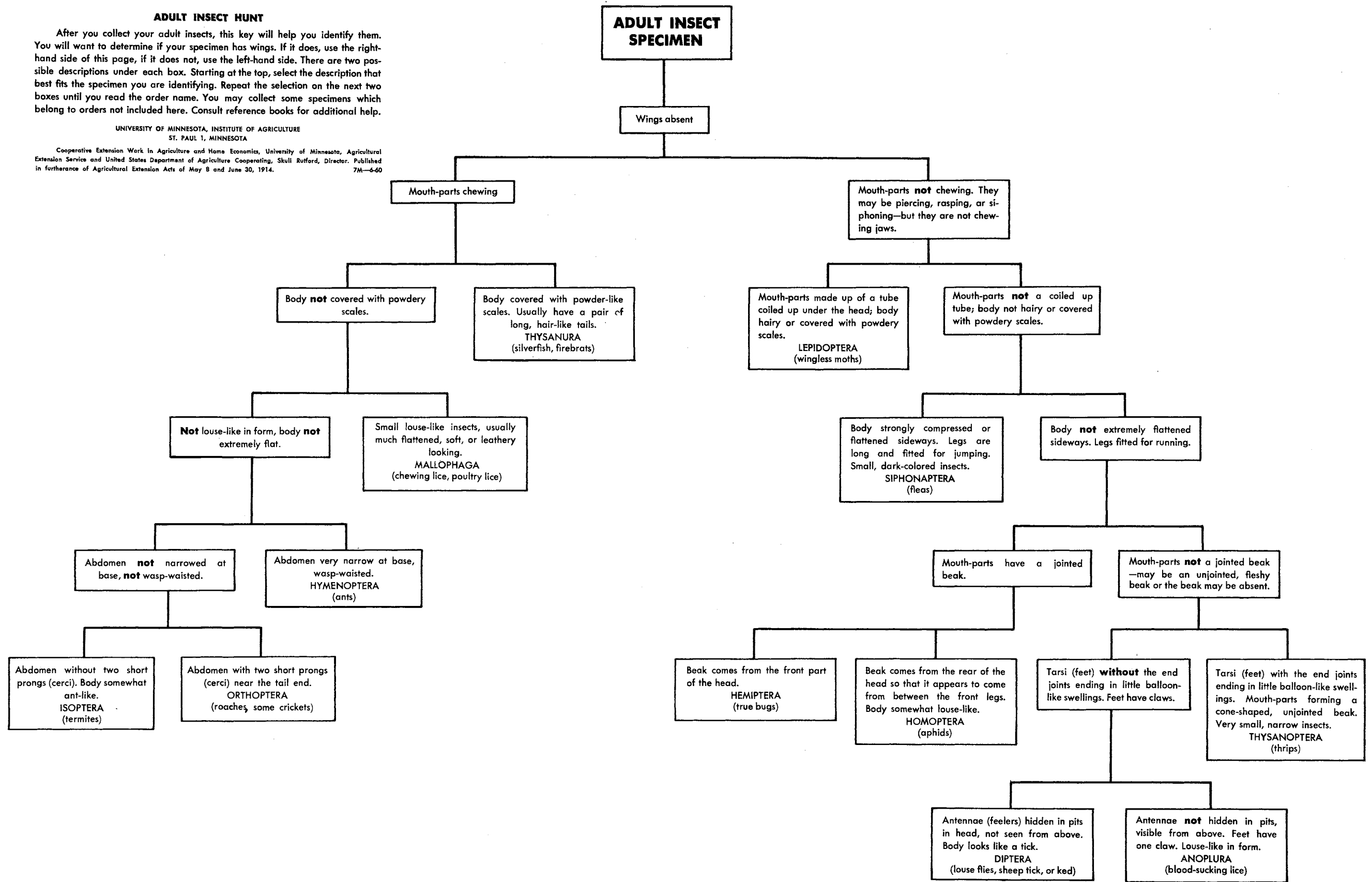


ADULT INSECT HUNT

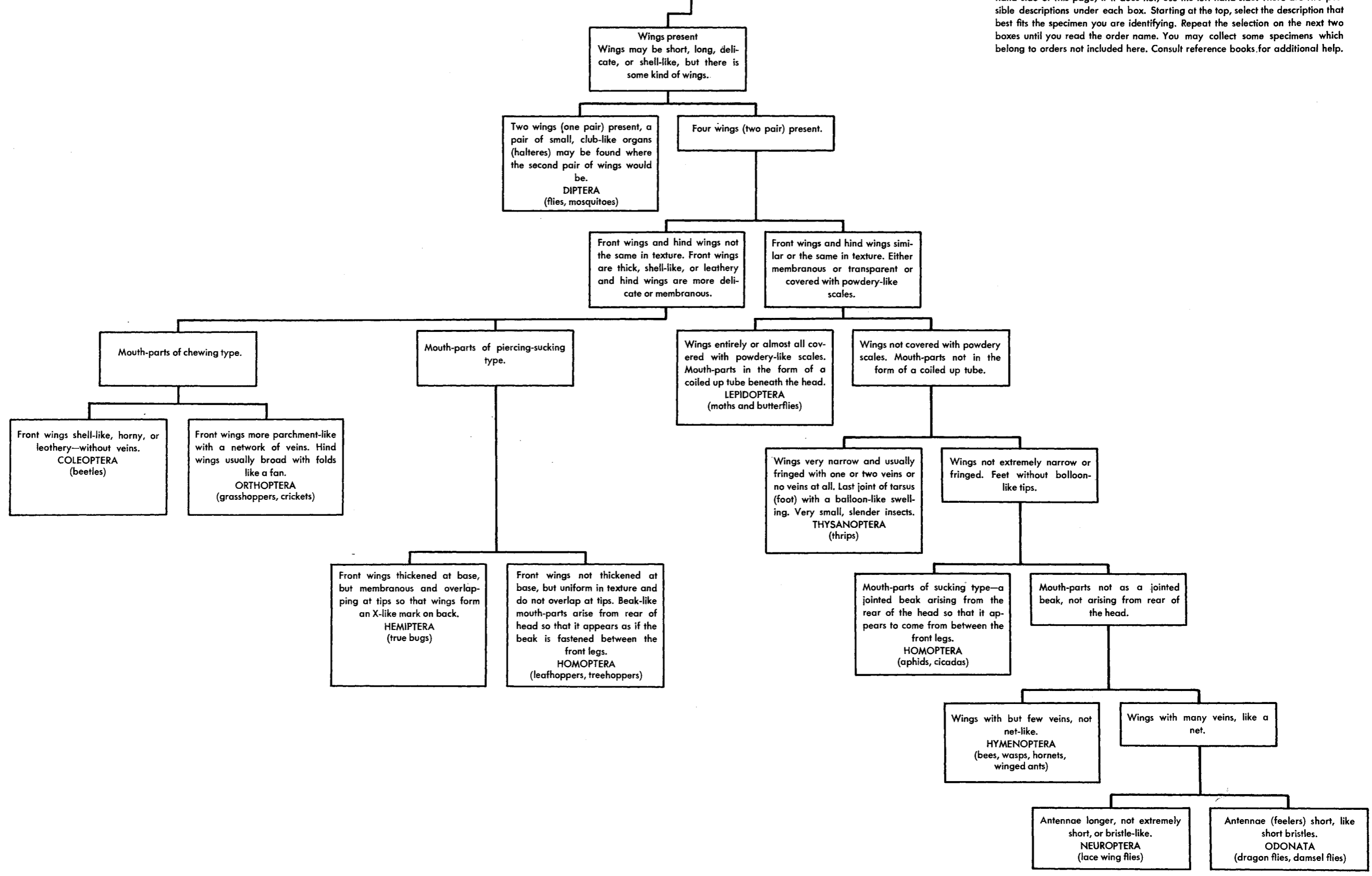
After you collect your adult insects, this key will help you identify them. You will want to determine if your specimen has wings. If it does, use the right-hand side of this page, if it does not, use the left-hand side. There are two possible descriptions under each box. Starting at the top, select the description that best fits the specimen you are identifying. Repeat the selection on the next two boxes until you read the order name. You may collect some specimens which belong to orders not included here. Consult reference books for additional help.

UNIVERSITY OF MINNESOTA, INSTITUTE OF AGRICULTURE
ST. PAUL 1, MINNESOTA

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Service and United States Department of Agriculture Cooperating, Skull Rufford, Director. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914. 7M-6-60

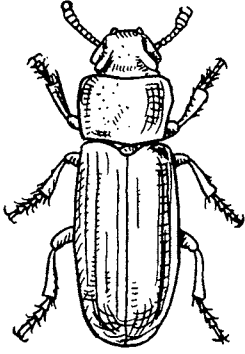


ADULT INSECT SPECIMEN



ADULT INSECT HUNT

After you collect your adult insects, this key will help you identify them. You will want to determine if your specimen has wings. If it does, use the right-hand side of this page, if it does not, use the left-hand side. There are two possible descriptions under each box. Starting at the top, select the description that best fits the specimen you are identifying. Repeat the selection on the next two boxes until you read the order name. You may collect some specimens which belong to orders not included here. Consult reference books for additional help.

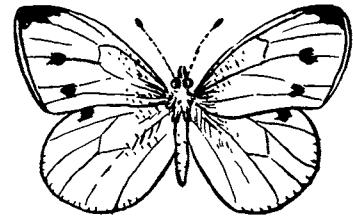


Coleoptera (Coleo-sheath, pteron-wing)
(Kō - le - op' - ter - a)

Front wings are shell-like or leathery. Hind wings are clear, folded under front wings. Has chewing mouth parts. Complete metamorphosis (egg, larva, pupa, adult). Includes the beetles; flea beetles, potato beetles, lady bird beetles, June beetles.

Lepidoptera (Lepid - scale, pteron-wing) (Lep - i - dop' - ter - a)

Four wings are covered with fine scales which rub off like powder. Has sucking mouth parts in adult stage. Has chewing mouth parts in larvae or caterpillar stage. Complete metamorphosis. Includes butterflies and moths.

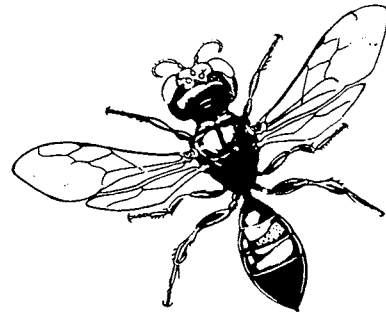


Diptera (Di - two, ptera-wings) (Dip' - ter - a)

Has two clear wings. Has two club-shaped organs in place of hind wings. Mouth parts are sucking (piercing or lapping). Complete metamorphosis. Includes true flies; house flies, horn flies, stable flies, mosquitoes, gnats, hessian flies.

Hymenoptera (Hymen-membrane, pteron-wing) (Hi - men - op' - ter - a)

Has four clear, membranous wings. Sometimes wingless. Mouth parts are chewing or specialized chewing-sucking, complete metamorphosis. Abdomen of some kinds with slender "wasp waist". Females of some kinds equipped with stingers. Hind wings smaller than front wings and sometimes hooked to the front wings. Includes ants, bees, wasps, hornets.



Equipment You'll Need

You won't need a lot of expensive equipment to collect and study insects. You can make most of it. Refer to the 4-H Club Insect Manual, USDA A. H. 65 for additional instructions.

Killing Bottle

Many insects may be collected without a net, but you need a method to kill them quickly. This is done with a killing bottle and carbon tetrachloride or xylene.

1. Select a wide mouth pint or half pint jar with a screw lid.

2. For carbon tetrachloride type: Caution: Carbon tetrachloride is hazardous and should be used outside or in a well ventilated room. Keep the container covered. Cut up small pieces of natural rubber (rubber bands, inner tube, etc.) to make a layer about 1/2 to 3/4 inch deep in bottom of jar. Just cover the rubber with carbon tetrachloride (dry cleaning fluid) and allow to soak for a couple of hours. Pour off excess. Cover the rubber with a piece of cardboard cut to fit inside the jar. Cover jar with tight lid.



3. For Xylene type:

Caution: Xylene is hazardous and should be used outside or in a well ventilated room. Keep the container covered. Xylene is highly flammable.



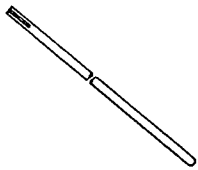
Proceed as above except use cotton or several scraps or cardboard in bottom of jar. Soak with Xylene, drain, and place circular piece of cardboard on top. An alternative method is to pin a wad of cotton to the inside of the lid and moisten the cotton with Xylene.

A killing bottle will last longer if you keep the lid on tightly at all times except when putting in or taking out specimens.

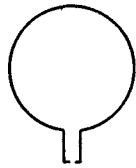
Collecting Net

You can collect many insects by picking them from plants, looking under logs, etc. However, a net is needed to collect many flying insects or to collect from crops such as alfalfa or potatoes.

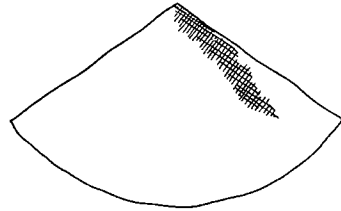
To make a general purpose net you will need: 1) a handle about 3 feet long (a broom handle will work). 2) About 5 feet of stiff wire (such as telephone wire) for the hoop. 3) A piece of unbleached muslin, nylon, or similar material about 3 x 5 feet for the net bag.



WOOD HANDLE

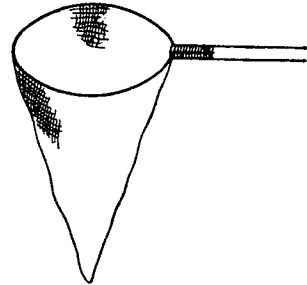


WIRE



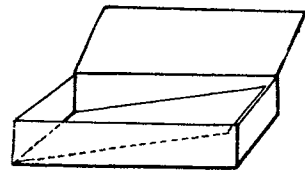
CLOTH PATTERN

1. Bend the wire into a hoop about 12 to 15 inches in diameter. Bend the ends out as shown.
2. Cut grooves and drill holes in the end of the handle so that the hoop will fit into them.
3. Cut the cloth from a pattern to make a bag 12 to 15 inches in diameter and 18 to 24 inches deep.
4. Sew a hem 1 to 1½ inches wide at top and sew up the edges to make the bag.
5. Slip the bag onto the wire hoop and fasten the hoop to the handle with fine wire or a clamp.



Collection Boxes

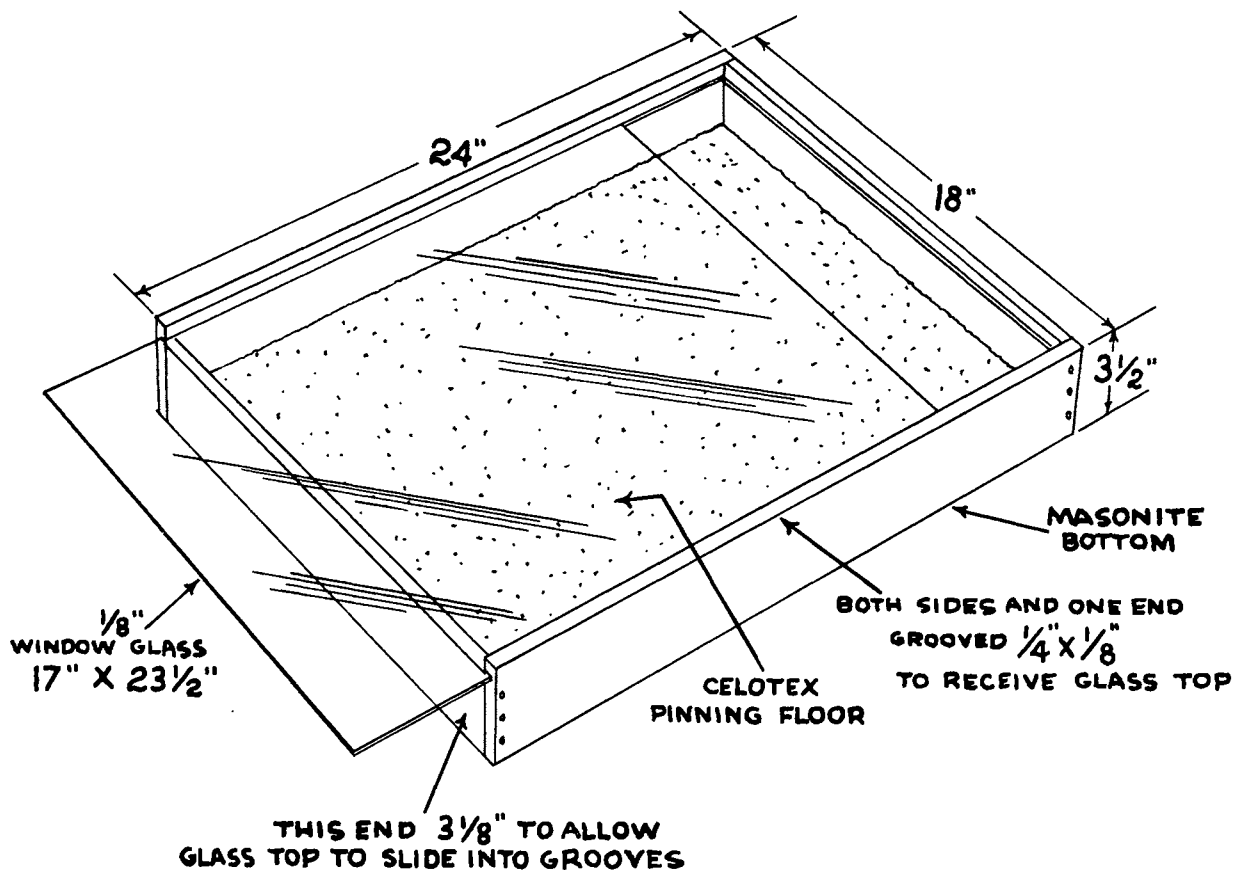
1. Cigar Box type
- Select a good box at least 2 inches deep. (The 6 x 8 inch size is recommended.)
 - Cut a piece of corrugated cardboard or soft wallboard to fit inside the box.
 - Glue the cardboard or wallboard to the bottom of the box. This gives the box a bottom into which you can pin your specimens.
 - Line a box with smooth paper and paint the box to make it look neat.
 - Fasten a moth ball securely in one corner of the box. This prevents pests, such as carpet beetles, from getting in to eat the specimens.



2. Glass top display type (18 x 24 inches)

You will need:

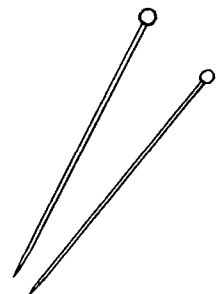
- ➔ 1 piece of masonite or hardboard for bottom--18 x 24 inches
- ➔ 2 side pieces (pine)-- $3\frac{1}{4}$ x $3\frac{1}{2}$ x 24 inches
- ➔ 1 end piece-- $3\frac{1}{4}$ x $3\frac{1}{2}$ x $16\frac{1}{2}$ inches
- ➔ 1 end piece-- $3\frac{1}{4}$ x $3\frac{1}{8}$ x $16\frac{1}{2}$ inches
- ➔ 1 piece of celotex or similar soft fiberboard (for pinning floor)-- $16\frac{1}{2}$ x $22\frac{1}{2}$ inches
- ➔ 1 piece of window glass ($\frac{1}{8}$ inch)--17 x $23\frac{1}{2}$ inches



GLASS TOP DISPLAY CASE

Pins

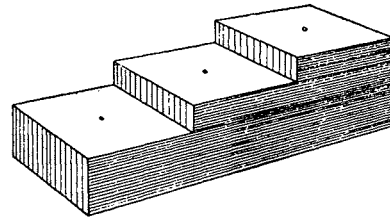
Use regular insect pins for mounting insects. You may purchase them from one of the supplies listed at the end of this section. Order size #2 or #3 insect pins.



Pinning Block

It is desirable to have specimens and labels in a collection at a uniform height on the pins. This is done most conveniently with a pinning block. A block may be made by gluing together four pieces of 1/4 inch strips, 1 inch wide, as illustrated. Drill small holes as shown:

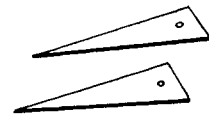
Pinning block for adjusting specimens and labels to a uniform height on the pin.



After you have an insect placed on a pin you may insert either the point or head end of the pin into the appropriate hole to adjust the specimen to the proper height on the pin.

Paper Points

Many insects are too small to mount directly on pins. A good way to mount these is by means of "points." The points may be cut from stiff paper like filing cards. Cut the triangular points about 1/2 inch long and about 1/8 inch wide at the base. It is suggested that you prepare a good supply of points at one time so that they will be handy when you need them and so they will be uniform in size. The use of the points is described in the section on pinning specimens.

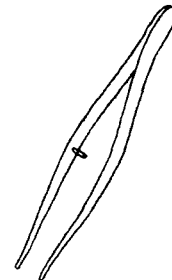


Glue

Mucilage or glue is needed when mounting small insects on points.

Forceps or tweezers

These are handy for manipulating your specimens when pinning them or mounting on points. Get some with thin points.



Spreading Board

Mount butterflies, moths, and some of the other large-winged insects with their wings spread out. A spreading board is used for this purpose. Eventually, you may want to make boards of several sizes for the different sized insects.

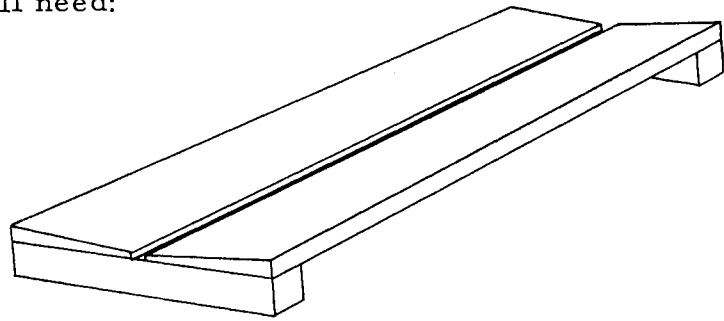
Adjustable spreading boards are available from some of the suppliers listed at the end of this section.

To make a board you will need:

➤ 2 blocks $5\frac{1}{2}$ inches long and 1 inch square

➤ 2 soft wood pieces 16 inches long, $2\frac{1}{2}$ inches wide, and about $\frac{1}{2}$ inch thick. (Plane these down on one flat surface so they are about $\frac{3}{8}$ inch thick on one edge.)

➤ One piece of corrugated cardboard or soft fiber board 14 inches long and about 1 inch wide.



Fasten the top pieces to the end pieces so that the thin edges are toward the center and about $\frac{3}{8}$ to $\frac{1}{2}$ inch apart. Next tack the cardboard or fiberboard on the under side to cover the slit between the top boards.

You may also make the spreading boards by gluing layers of cardboard together or make the boards flat, whichever you prefer.

File Cards

White file cards may be used to make paper points and labels. Your labels should be uniform in size. It is suggested that you cut a good supply of blank labels at a time. Make them about $\frac{1}{4}$ to $\frac{1}{2}$ inch wide and $\frac{3}{4}$ to 1 inch long. Keep them in a small box like a pill box.

Special Equipment

Cages for rearing insects and any other special items will be discussed as those parts of the project are explained.

Places where you may obtain entomology supplies and equipment

Most of the following will send you free catalogs or price lists.

Biometal Associates
Box 346
Beverly Hills, Calif.

Ing. H. Buchberger
Solaristrazze 14
Salsburg, Austria

Carolina Biological
Supply Company
Elon College
North Carolina

Central Scientific Supply Co.
1700 Irving Park Road
Chicago, Illinois

Clay-Adams Company, Inc.
44 E. 23rd Street
New York 10, New York

General Biological Supply
House
8200 S. Hoyne Avenue
Chicago 20, Illinois

Mr. Herman Kreye
Hannover, Germany

National Agricultural
Supply Company
Fort Atkinson, Wisconsin

Scientific Supply Company
Seattle, Washington

Turttox, General Biological
Supply House, Inc.
761-763 East 69th Place
Chicago, Illinois

Ward's Natural Science
Establishment, Inc.
3000 Ridge Road East
Rochester 9, New York

Mr. Robert G. Wind
827 Congress Avenue
Pacific Grove, Calif.

Collecting Insects

To begin with, concentrate on collecting and mounting only the adult stages of insects. Later you will learn how to take care of the immature forms.

Many specimens can be picked from plants, the ground, buildings, etc. Then they can be dropped into the killing bottle. However, most insects can be collected by sweeping plants, weeds, shrubs, etc. with the net. Practice and experience will help you find the best hunting grounds.

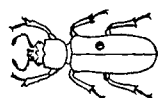
When collecting and handling moths and butterflies, be careful so that you don't fray the wings or rub the powdery scales off the wings. Grasp them by the thorax with the wings held together over their bodies, until you can put them into the killing jar.

Pinning Insects

Pin insects shortly after they are collected -- before they dry. If dried specimens are to be pinned they must be relaxed first.

To relax dried insects, place an inch to two of sand in the bottom of a large jar that can be closed tightly. Saturate the sand with water. Place the dried insects in a flat dish or jar lid and lay it on top of the sand. Cover the jar tightly. Leave it closed for about 1/2 day. Take the insects out and mount them. Don't leave insects in the jar for over a day or they will mold.

Mount the larger insects directly on pins. Pin them through the right side of the thorax or wing cover (beetles) and face them away from you. Be sure the pin is straight up and down from all angles. This will take some practice.



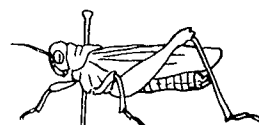
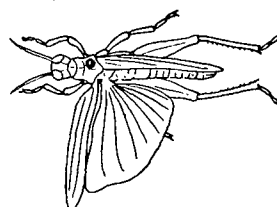
Beetle



Bee



Bug

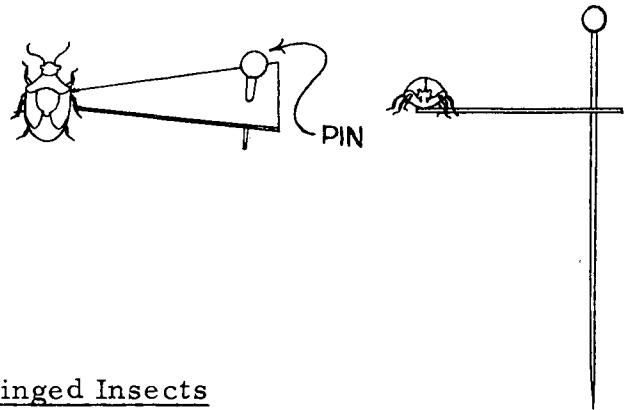


Grasshopper

INSECTS, PROPERLY PINNED

Mount the insects which are too small to pin on the paper points. Fasten the insect with a very small amount of glue to the tip of the point. The point should be to the left of the pin and the insect's head should be away from you.

Be sure the specimen is "square with the world" and not at an angle. This takes more practice! Be sure that about one-third of the length of the pin projects above the specimen or point so that it may be handled. Use the pinning block to get the specimens at a uniform height.

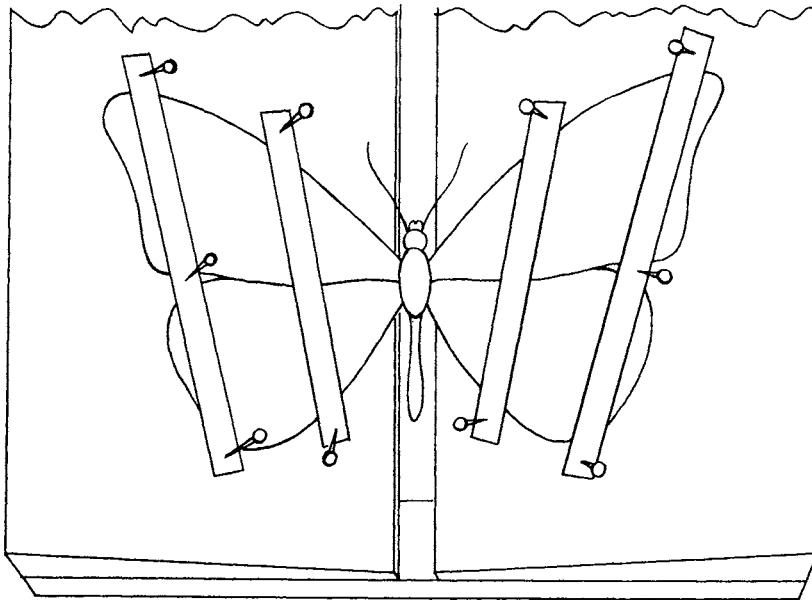


Spreading Winged Insects

Mount moths, butterflies, and some of the other winged insects like grasshoppers with the wings, or the wings on one side of the body, spread. A spreading board (described in the equipment section) is used as follows:

1. Pin the insect as instructed.
2. Insert the pin in the center space of the spreading board and lower the pin so that the wing attachments are level with the top surface of the board.
3. Use an insect pin in each hand to lower and manipulate the wings. Put the points of the pins behind large wing veins and move both the front wings down and/or forward together.
4. Be sure the hind margin of the front wings is perpendicular to the axis of the body.
5. Stick the pins through the wings into the board to hold them in place while you move the hind wings.
6. Use two more pins and the same procedure and move the hind wings so that the front margins just meet the hind edges.
7. Now take some strips of paper (about 1/2 inch x 3 or 4 inches) and lay two or three strips across the wings and pin these strips firmly in place. You may wish to use one wide strip for each wing instead of a couple of the narrow ones.
8. Place the board out of the way for about two weeks to allow the specimen to dry thoroughly before removing it from the board to add to your collection.

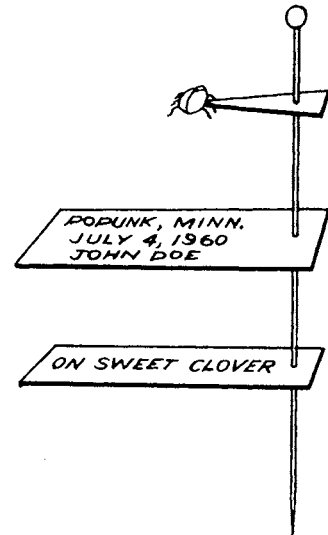
You may prepare insects such as grasshoppers with the wings on only the right side spread, leaving the left pair normal, or closed.



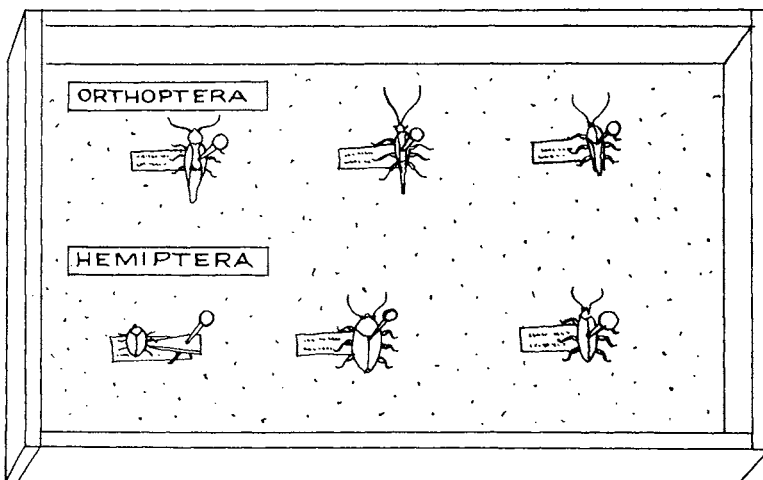
Labelling Specimens

Label each specimen in your collection. The minimum information on labels should include the place or locality collected, the date collected, and the collector's name. On a second label indicate the plant or situation on which the insect was found, if possible. Have labels uniform in size and location on pins, and print them neatly. Use the pinning block to place the labels on the pin.

Also use labels to indicate the orders in your collection. These may be pinned flat on the bottom of the box. Don't glue them; you will probably move them as your collection grows.



Arranging Specimens

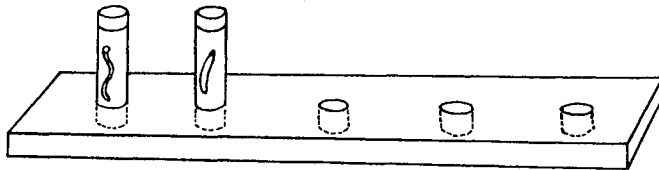
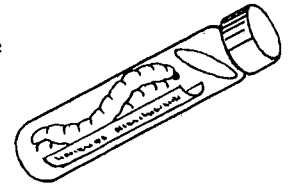


The correct way to pin your specimens in the collection or display boxes is in parallel rows as shown.

Preservation of Immature Stages

It is not possible to mount caterpillars or grubs on pins and have much of a collection. There are some methods by which these specimens may be mounted.

The simplest way to do this is to put the larva in a small vial of alcohol or formaldehyde. Put a label in the vial with the specimen.



The vials may be kept in a small box or displayed on a rack, such as a board in which you make holes to fit the vials.

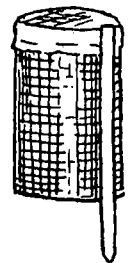
Rearing Insects

As you collect and observe insects you will notice that many of the insects you see are in the immature stages of development. Many insects cause economic damage as larvae -- maggots, caterpillars, grubs -- or as nymphs. Because of this, the study of immature insects is very important and is a study that often is neglected. A person must spend a lot of time to get detailed information about these "youngsters" of the insect world. However, you can learn a great deal about a few of them by making life history studies and by raising the insects through their life cycles.

There are many different ways to confine insects for rearing. If you catch some caterpillars, like cecropia larvae, you can put them in a screen cage and supply suitable food. The food you give caged insects should be that on which they normally feed. Clean cages regularly. In selecting an insect to study by rearing choose one which has more than one generation per year, such as cabbage worms.



Some insects may be confined right on the plant on which they live. A cage may be made from a glass lamp chimney with cheesecloth over the top. Tie the cloth on securely and place the chimney over the plant. Another cage may be made with a cylinder of wire screen.



Keep records. Record all the information you can -- duration of each stage, description of each stage, etc.

Insect Control

For information on effective control measures, consult circulars, bulletins, and other publications on the specific insect or problem. Your county extension agent can help you with insect control practices.

Principles of Insect Control

Here is how to control insects:

1. Know the insect. It is very important that you properly identify the insect.
2. Learn its habits. Observe it live, consult references books, circulars, and other literature, or ask someone who knows. Once you know the habits, food, needs, etc., then you can determine how to control the insect in question by breaking its life cycle.
3. Select control method or methods. The life cycle of an insect may be broken by some cultural practice, a barrier, or by a chemical. Select the one or more methods which will bring about the most effective, practical, and economical control. Sometimes it is necessary to use all possible methods.

Methods of control

Example

- | | |
|---------------|---|
| a. Mechanical | Fly swatter or trap |
| b. Cultural | Crop rotation, pruning, proper planting date |
| c. Chemical | Insecticides, fumigants, repellants, attractants, baits |
| d. Biological | Parasites or predators |
| e. Legal | Inspections, quarantine |

4. Use the right methods properly. For effective insect control by spraying, use the right dosage, apply the spray at the right time, cover plants or animals properly, etc. The best method is no good unless it is used right.
5. Record results. Write down what you did, when, how, and with what results.

USE OF INSECTICIDES

In recent years we have relied more and more on chemicals for controlling our insect pests. There is a very wide variety of insecticides available now and you should consult current bulletins, circulars, and other literature for the latest recommendations.

Chemicals are available in several different forms:

Dusts are fine powders that are used dry. They should be applied with hand, puff-type dusters, rotary dusters, or larger power dusters.

Wettable powders are also fine powders but contain a higher concentration of the insecticide and also a wetting agent. This wetting agent, like a detergent, allows the powder to be mixed with water. These powders should be mixed with water to make sprays. They are suited best for use in large power sprayers that keep the powder mixed up in the water. In hand sprayers the powder tends to settle and will clog the nozzles of the sprayer.

Granules are small pellets, ranging in size from granulated sugar to coffee grounds. This form is used dry. Most uses are for applications to the soil and for corn borer control. They may be applied with seeders, fertilizer spreaders, or with special granule applicators.

Emulsifiable concentrates are liquids containing a high concentration of the insecticide. They also contain a material called an emulsifier which allows the chemical to mix with water to form a milky emulsion spray. Emulsions may be used in all types of sprayers.

Oil solutions are liquid preparations usually ready to use. They should not be mixed with water. They are primarily to control household insects such as roaches, carpet beetles, and clothes moths. They may be applied with hand or power sprayers and they are sometimes applied with a paint brush.

Aerosol bombs are handy, ready to use, pressurized cans of insecticides. They are essentially oil solutions and a propellant gas in a container equipped with a release valve. The aerosols are used mostly to control insects like flies and mosquitoes in buildings.

READ THE LABEL All insecticides must be handled carefully and according to the directions. Some of these chemicals are dangerous to the user and some may leave harmful deposits or residues on treated crops or livestock if used improperly.

When using insecticides read the information on the labels of the packages very carefully so that you understand it. Then follow the directions exactly. Use insecticides only on the crops listed on the label at the correct time and at the correct rates.

Example:

5% DDT dust

50% DDT wettable powder

20% aldrin granules

25% DDT emulsifiable concentrate

2% chlordane household spray

References

Here is where to find additional information. Your local library may have some of these. Also, see your county agent for literature and information on such things as control measures.

- ① 4-H Club Insect Manual
Agr. Handbook 65, USDA
- ② Collection and Preservation of Insects
Misc. Pub. 601, USDA
- ③ Insects
Yearbook of Agriculture, 1952, USDA
- ④ The Insect Guide
by R. B. Swain, 1948
- ⑤ An Introduction to Entomology
by J. H. Comstock
- ⑥ Destructive and Useful Insects
by Metcalf, Flint, and Metcalf
- ⑦ Insects of Farm, Garden and Orchard
by Peairs and Davidson
- ⑧ A Field Guide to the Butterflies
by A. J. Klots
- ⑨ Fieldbook of Insects
by F. Lutz
- ⑩ An Introduction to the Study of Insects
by Borror and DeLong
- ⑪ How to Know the Insects
by H. E. Jacques
- ⑫ A Testbook of Entomology
by Herbert Ross, Second Edition
- ⑬ Insects
by H. Zim and C. Cottam
- ⑭ Handbook of the Insect World
by Hercules Powder Company, Inc.

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

(use additional sheets, as needed)

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

(use additional sheets, as needed)

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

(use additional sheets, as needed)

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

INSECT RECORD SHEET (Junior and Advanced Units)

(Fill out one sheet for each one of at least five important insects in your collection)

I. Your name _____ Date collected _____

Common name _____

Scientific name (if known) _____

Order of this insect _____

II. Description

A. Approximate size _____

B. Color _____

C. Type of mouthparts (chewing, sucking, etc.) _____

D. Number and nature of wings _____

E. Other important characteristics _____

III. Food (plant, animal, etc., on which it feeds) _____

IV. How does this insect spend the winter? _____

V. Economic importance (pest, beneficial) _____

A. If pest, name injurious stage(s) _____

B. Stages against which control measures are directed _____

C. Control measures (cultural, chemical, etc. describe) _____

LIFE HISTORY STUDY (Advanced Unit)

(Rear and study at least ONE insect)

1. Name of insect _____

Order _____

2. Food plant or host _____

3. Type of mouthparts:

Larva or nymph _____

Adult _____

4. Eggs: a. Color _____

b. Shape _____

c. Laid singly _____ or in groups _____ Size _____
(Make mark)

5. Describe the young insect which hatched from the egg:
(color, size, shape, legs, etc.)

Date eggs hatched: _____

6. Describe the changes which took place in these insects:

7. Did the insect change to a pupa? _____ Date _____

Describe the pupa: _____

8. When did the insect become adult? _____ Total number of
days, egg stage to adult: _____

LIFE HISTORY STUDY (Advanced Unit)

(Rear and study at least ONE insect)

1. Name of insect _____
Order _____
2. Food plant or host _____
3. Type of mouthparts:
Larva or nymph _____
Adult _____
4. Eggs: a. Color _____
b. Shape _____
c. Laid singly _____ or in groups _____ Size _____
(Make mark)
5. Describe the young insect which hatched from the egg:
(color, size, shape, legs, etc.)

Date eggs hatched: _____
6. Describe the changes which took place in these insects:

7. Did the insect change to a pupa? _____ Date _____
Describe the pupa: _____

8. When did the insect become adult? _____ Total number of
days, egg stage to adult: _____

LIFE HISTORY STUDY (Advanced Unit)

(Rear and study at least ONE insect)

1. Name of insect _____

Order _____

2. Food plant or host _____

3. Type of mouthparts:

Larva or nymph _____

Adult _____

4. Eggs: a. Color _____

b. Shape _____

c. Laid singly _____ or in groups _____ Size _____
(Make mark)

5. Describe the young insect which hatched from the egg:
(color, size, shape, legs, etc.)

Date eggs hatched: _____

6. Describe the changes which took place in these insects:

7. Did the insect change to a pupa? _____ Date _____

Describe the pupa: _____

8. When did the insect become adult? _____ Total number of
days, egg stage to adult: _____

LIFE HISTORY STUDY (Advanced Unit)

(Rear and study at least ONE insect)

1. Name of insect _____

Order _____

2. Food plant or host _____

3. Type of mouthparts:

Larva or nymph _____

Adult _____

4. Eggs: a. Color _____

b. Shape _____

c. Laid singly _____ or in groups _____ Size _____
(Make mark)

5. Describe the young insect which hatched from the egg:
(color, size, shape, legs, etc.)

Date eggs hatched: _____

6. Describe the changes which took place in these insects:

7. Did the insect change to a pupa? _____ Date _____

Describe the pupa: _____

8. When did the insect become adult? _____ Total number of
days, egg stage to adult: _____

UNIVERSITY OF MINNESOTA



3 1951 D01 783 056 G

UNIVERSITY OF MINNESOTA, INSTITUTE OF AGRICULTURE
ST. PAUL 1, MINNESOTA

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Service and United States Department of Agriculture Cooperative Extension Service, St. Paul, Minnesota. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914.