

# Investigating Insects

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*OISE/UT*



## Learning Expectations

1. To collect and identify insects from a variety of habitats.
2. To classify insects according to structure.
3. To examine insects and relate their structure and habits to their environment along with their ability to survive.
4. To develop a general awareness of insects and their importance to humans.

## Background Information

Insects are a remarkable group of animals. Entomologists around the world have identified over 800,000 different species of insects. That is twice as many as all the other animals put together. Scientists believe there may be from 1 million to 10 million types of insects still undiscovered.

Despite their wide variety, there are certain general characteristics that can be identified.

Adult insects are featured with:

- 6 jointed legs
- 2 antennae
- 3 body divisions
  - head (eyes and antennae are attached here)
  - thorax (wings and legs are attached here)
  - abdomen

- hard outer covering called an exoskeleton
- most have one or two pairs of wings (some are wingless)
- compound eyes; many also have simple eyes
- more than half of all insects are very small (less than 0.5 cm) but a few grow to about 15 cm

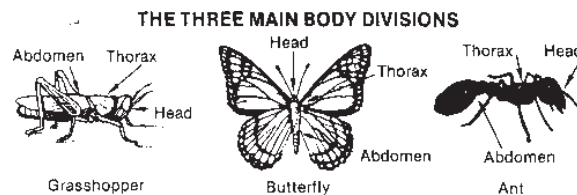
Insects live in almost every type of environment, however, very few live in the ocean. There may be many kinds of insects living in one area or habitat. They can live in places that are too small for other animals and where they can also find food and protection from enemies.

Much of the success of insects results from their powers of reproduction. Most insects have short lives. They quickly become adults and reproduce. Most insects lay numerous eggs and many species produce several generations during a season. Insects also have special methods of reproduction. The females of some species can reproduce without mating. For example a queen honeybee after mating only once can lay eggs for the rest of her life.

Insects affect humans in many ways. Although some carry disease and others destroy food crops and forests many insects are very important to the environment and to humans. Without insects, life as we

know it on earth would be impossible.

In this activity, you will collect insects from a variety of habitats or areas. You will then examine the insects and complete worksheets. When you return to school, you will relate the insect's structure and adaptations to its environment.



## Materials

- insect identification picture keys and field guide books
- insect worksheets
- bug boxes (a small clear plastic box that has a magnifying lens set in the removable lid)
- hand lens
- two-way viewers
- butterfly nets
- dip nets
- bug catchers (optional)
- beating (collecting) sheets
- trowels
- white enamel or plastic sorting trays/pans
- eyedroppers
- buckets

## Procedure

### IMPORTANT

- DO NOT HARM ANY INSECT
- SOME INSECTS WILL BITE OR STING IN DEFENCE SO HANDLE WITH CARE.
- AFTER OBSERVING INSECT RELEASE THEM TO THE AREA WHERE YOU FOUND THEM.
- RETURN ALL ROCKS AND LOGS TO THEIR ORIGINAL POSITION.

1. You will be divided into groups, each group collecting from a different habitat: e.g. field, forested area, rotten log/dead tree, creek. Within each habitat, insects will be collected in a number of different ways:

#### a) Flying Insects

equipment: net, bug boxes

method:

- shake vegetation to get insects to fly
- catch insects in the net
- examine insects in bug boxes

#### b) Insects On Vegetation

equipment: a beating sheet, net, bug boxes or hand lens

method:

- look for insects on plants
- place sheet under vegetation and shake branches
- sweep net through tall grass, wildflowers and low shrubs
- examine insects in bug boxes or with hand lens

#### c) Insects On The Ground

equipment: bug boxes or hand lens, white tray/pan, trowel

method:

- look under rocks, fallen leaves and logs and on the ground amongst the grass and wildflowers
- examine insects in bug boxes or with hand lens

#### d) Insects In The Soil

equipment: trowels, bug boxes or hand lens, white tray/pan

method:

- scoop soil and place it in the tray
- also look in dead logs and stumps
- examine insects in bug boxes or with hand lens

#### e) Insects In A Rotting Tree

equipment: bug boxes or hand lens

method:

- look for evidence of bark beetles, engraver beetles, carpenter ants, eggs, etc. under the bark and in the rotting wood
- examine insects in bug boxes or with hand lens

#### f) Insects In Water

equipment: nets, pails, white trays/pans, eye droppers, 2-way viewers

method:

- dip nets into water and rinse in a half bucket of water
- transfer some water and insects to a white tray/pan
- examine insects in 2-way viewers or with hand lens

2. Describe the insects collected in each habitat by completing the insect data sheets and charts. Use identification keys and field guide books to name the insects.

3. Insect signs are often more apparent than the insects themselves. Insect homes such as galls, leaf-miner tunnels, leaf-roller cases, cocoons, nests and tunnels in wood and earth are clues to the presence of insects. Record evidence of insect signs and note their location.

4. Listen for three different insect noises. Describe each.
5. Choose one insect that you caught. Research its life cycle, what it eats, adaptations for survival (e.g. colour, shape, defenses, etc.), methods of locomotion and respiration and its range.

## INSECT SIGNS

Insect signs are often more apparent than the insects themselves, even in warm weather. Insect homes include galls, leaf-miner tunnels, leaf-roller cases, cocoons, mud nests, and tunnels in wood. Each is a clue to the presence of insects.

### GALLS

Galls are abnormal swellings or growths found on almost any part of a plant. Galls may be caused by bacteria, viruses, mites, flies, and bees. The mechanism causing them is relatively obscure but rapid, uncontrolled cell division appears to occur in the plant tissue in response to foreign material within it. In the case of insect galls, the female insect inserts one or more eggs into the plant tissue, triggering the response.

It is interesting to try to rear the insects. The entire plant can be potted and brought indoors or the study can go on outdoors. In any event, the simplest way to collect the adult insect is to construct a fine net cage around the gall until it emerges. Some gall insects have parasites that lay their eggs inside the gall. Their young feed on the developing gall insect.

### LEAF-MINERS

Leaf miners are insects that develop within a leaf. An egg is inserted between the upper and lower layers of leaf tissue. The young insect eats the spongy tissues, thus producing irregular blotches or tunnels. A careful observer can learn a great deal about the developing insect, for the living, wormlike larva can often be seen when the leaf is held up to the light. These insects can be reared in the same manner as gall insects, but since some pupate in the soil, the entire plant may need to be caged. There are about 500 species of miners in North America, and each has a characteristic “mine” in a particular plant.

## LEAF-ROLLERS

Leaf-Rollers are insects that roll leaves into “homes.” Some use a cluster of leaves or individual leaves, but most cut portions of a leaf and roll them. Once a person has recognized this group, one finds they are more common than one might suspect. Most leaf-rollers are moths or butterflies, and most use only one kind of plant.

## PAPER NESTS

The paper nest of the bald-faced hornet (*Vespula maculata*) is quite distinctive. These insects chew wood into a gray, paper-like material and construct a nest, often larger than a football, somewhat globular and usually attached to a tree or shrub. The hornet itself is large, black, and light yellow with the front of the head light yellow (bald-faced). Caution: This insect has one of the most potent stings found in the insect world.

Other wasps make paper nests, but these are generally tan in color and smaller and less elaborate than those of the bald-faced hornet. If the nest is occupied, stay away and do not annoy these insects, for they are easily upset and will sting repeatedly.

## MUD NESTS

Mud nests are made by some wasps. The nests of the “organpipe” wasp can be found on buildings or rock outcroppings. These nests are tubes up to about 20 cm long placed alongside of each other. The adults use these tubes as “nurseries” rather than as homes. The tubes are chambered, each chamber containing an egg with enough paralyzed insects to provide food for the developing larva.

Potter wasps form small jug- or vase-shaped mud nests on tree branches. Each “pot” contains an egg with food.

## GROUND NESTS

Yellow-jackets, bumble bees, and some of their relatives dig burrows into the ground. Yellow-jacket nests, for instance, contain many individuals.

Most people are familiar with ant nests. Many ants live in the ground, but carpenter ants tunnel extensively into dead or diseased wood. The nests of carpenter ants are not easily confused with those of termites, for in general, termites have no apparent outward signs except for a paper-thin shell of wood. Termites work very fast and their nests must somehow remain in contact with the soil, hence, pencil-thick tunnels of mud are often constructed for long distances by termites between nest and soil.

## BARK TUNNELS

Often, when bark is stripped from logs, the tunnels made by bark beetles between bark and wood become apparent. The most fascinating of these consists of a long, usually vertical channel in which the female lays the eggs. Radiating out from it are twisty channels gradually increasing in width that were made by the larvae as they developed. Large-scale infestations of these beetles can girdle and kill a tree.

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### For Further Reference

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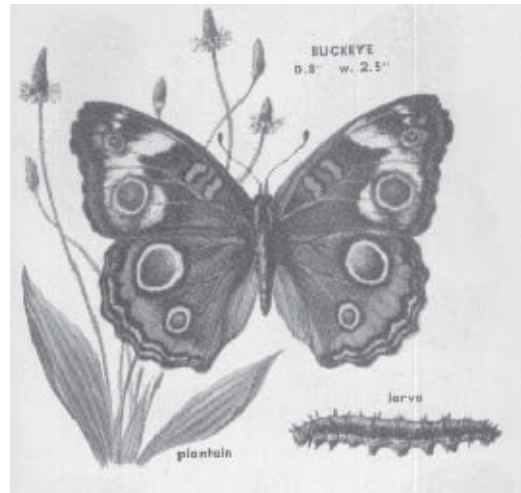


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This activity has been adapted from the Nonquon Environmental Education Centre - Insect Program, The Durham District School Board.

# Insect Data Sheets

Make a list of the insects found by your class on the chart below

Insect	Forested Area	Field	Near Water
Flying			
On Vegetation			
On the Ground			
In the Soil			
In a Rotting Tree			

# Observations



1. Record your findings on the insect data sheets.

2. Colouring can protect insects from predators in three ways.

Bright colours often act as a warning signal meaning “poisonous” or “bad tasting”.

Some insects imitate part of a plant, like a walking stick.

Some insects have a colour which blends in with their surroundings (i.e. camouflage).

Examine your insects and decide which of the three ways they are using to protect themselves. (Use a checkmark.)

Insect	Warning	Imitation	Camouflage

3. From your own observations, choose one insect and complete the chart below.

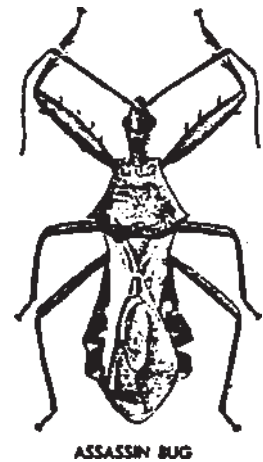
1. Locomotion	-
2. Feeding	-
3. Reproduction	-
4. Protection	-
5. Respiration	-

4. Make a sketch of some of the following insect structures you observed with the hand magnifiers.

- a) a compound eye
- b) a moth or butterfly wing
- c) a moth and a butterfly antenna (compare)

- d) an insect's leg
- e) an insect's mouth parts
- f) a fly's wing

5. Record evidence of insects and state where they were found.



ASSASSIN BUG

Evidence of Insect	Location	Insect
<i>web nest</i>	<i>tree branches</i>	<i>eastern tent caterpillar</i>

6. Describe each insect noise you detected.

## Discussion

1. a) In which area are the most insects found? Why?
  - b) Where did you find the fewest insects? Why?
2. a) In which habitats are hard-bodied like beetles insects found? Explain why?
  - b) State the habitat where soft-bodied insects are most abundant? Why are they most numerous here?
3. Which insects are the most abundant? Why?
4. Choose one insect and draw a large sketch. Label the important insect parts and any features it may have.
5. a) Research how and where insects overwinter.
  - b) By overwintering, how are insects harmful? How are they beneficial?
6. Choose one insect you caught. Research its life cycle, what it eats, adaptations for survival (e.g. colour, shape, defence etc.), methods of locomotion and respiration and its range.

## Insect Description

Insect Name	Where Found	No. Found	Mouth Parts	No. and Type of Wings	No. of Legs	Size	Colour and Shape	Niche (Role)