

Montana  Pollinator
Education Project



Cuckoo bee, Jon Yuschock, Bugwood.org

Lesson Title: Is it a bee?

Grade: 2-4

Duration of Lesson: 2- 45 minute classes

Brief: Students will understand the visual elements of bee identification.

Materials:

Montana Pollinator Education Project Bee Identification cards

Montana Pollinator Education Project Poster

Additional pollinator posters from Montana Department of Agriculture if available, can also be seen at:

[Pollinator Posters](#)

Key Terms

Agriculture, bee, wasp, fly, cuckoo bee, cleptoparasite, pollen, nectar, hairy, abdomen, thorax, head, hornet, perennial colonies, basket, and pollinator.

MONTANA COMMON CORE STANDARDS:

ELA 4. and 5. Reading Informational Texts

4. Craft and Structure: Determine the meaning of general academic and domain-specific words or phrases in a text relevant to grade topic or subject area.

ELA 6. Reading Informational Texts

4. Craft and Structure: Determine the meaning of words and phrases as they are used in text, including figurative, connotative, and technical meaning.

NGSS 4. Structure, Function, and Information Processing

Disciplinary Core Ideas, LS1.A: Structure and Function

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

NGSS 3. Inheritance and Variation of Traits: Life Cycles and Traits

Disciplinary Core Ideas, LS3.B: Variation of Traits

Different organisms vary in how they look and function because they have different inherited information. (3-LS3-2)

NGSS 2. Interdependent Relationships in Ecosystems

Science and Engineering Practices, Planning and Carrying Out Investigations

Make observations (firsthand or from media) to collect data, which can be used to make comparisons. (2-LS4-1)

<u>Understanding(s) /Big Ideas:</u> Students will understand the difference between pollinating bees and flies and wasps.	<u>Essential Question(s):</u> How can I differentiate a bee from a fly and wasp?
<u>Students will know:</u> Bees have body parts to help with pollination. Bees are unique in their pollen/nectar diets.	<u>Students will be able to:</u> Visualize the difference between bees, wasps, and flies.
Performance / Observations	
<u>Performance Task(s):</u> Create a drawing or a 3D bee, wasp, or fly.	<u>Other Evidence:</u> Students will correctly illustrate anatomy of bees and wasps based upon non-fiction text.
Learning / Inquiry Activities	

Introduction

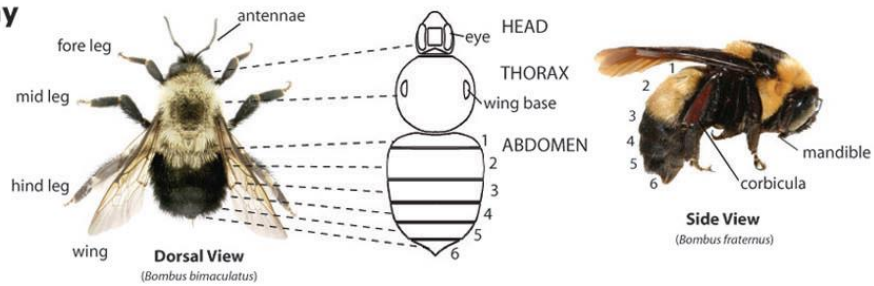
The tiny hair on a bee is perfect for pollen to attach to, even if the bee does not touch the pollen directly the electrostatic charge of the hair makes the grounded pollen “jump” to the hairs. Hair on some bees like the Bumble bee is also used to help keep the bees warm.



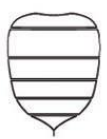





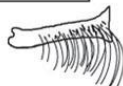


<http://www.public-domain-image.com/>

Bees have many body parts that serve specific purposes, the illustrations below can be used to illustrate and familiarize students with these parts. Male and female bees can have different body anatomy.

Bumble bee Anatomy



Distinguishing Males from Females

Female	Male
 <p>abdomen rounded; 6 abdominal segments; tip of abdomen pointed with a sting</p>	 <p>abdomen more narrow and elongate; 7 abdominal segments; tip of abdomen blunt</p>
<p>shorter antennae: 12 segments</p> 	<p>longer antennae: 13 segments</p> 
<p>very little yellow hair on face, legs, and underside</p>	<p>often yellow hair on face, legs, and underside</p>
<p>hind leg expanded into corbicula, a shiny bare concave area framed by elongate hairs, often covered with a pollen ball</p> 	<p>hind leg not expanded much, convex, hairy on surface</p>
<p>mandibles: wide and scoop-like</p> 	<p>mandibles: narrow and finger-like; bearded</p> 
<p>eyes always regular-sized</p>	<p>males of some species have large eyes</p>
<p>present spring - fall</p>	<p>present mid summer - fall</p>
	 <p>regular-eyed male</p>  <p>large-eyed male</p>

Queen or Worker?

Aside from differences in color pattern for some species, queen and worker bumble bees differ physically in size, with workers being smaller. Queen and worker sizes vary somewhat across species, but the ranges and averages are:

Queen (15 - 27 mm)
av. = 21 mm



Worker (6 - 19 mm)
av. = 14 mm



Queens visit flowers early in the spring and late in the summer and are uncommon in mid-summer; workers occur from late spring to early fall and are most common in mid-summer

Carpenter bee?

Carpenter bees (*Xylocopa* sp.) are frequently misidentified as bumble bees. Here are some of the features unique to *Xylocopa*:

wide round head

tubular hairy "brush-like" leg

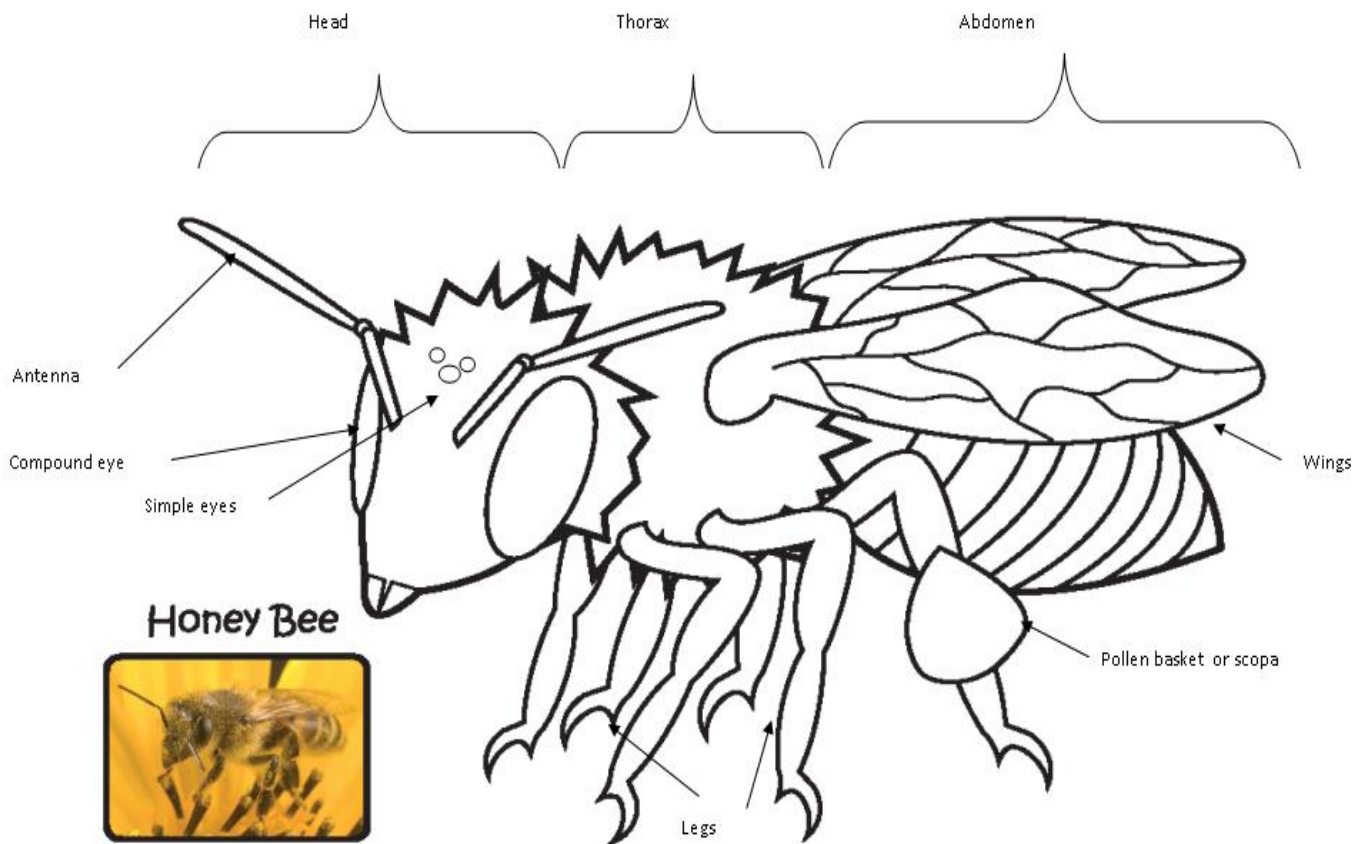


short hairs

shiny black metallic exoskeleton

http://beespotter.mste.illinois.edu/topics/key/images/male_female2008.pdf

Honey Bee



Montana Pollinator Education Project

Look at the following illustrations to become familiar with the anatomy of a bee.

You may also wish to visit these sites for more information:

Bumble bees: <http://www.bumblebee.org/body.htm>

[Montana State University Extension](#)

Honey bee information

[Pollinator Partnership](#)

Is It or Isn't It a Bee?

Bee: A bee differs from other floral visitors in having been fed pollen as a larva. If you see an insect toting a load of pollen either on its hind legs or beneath its abdomen, it is a female bee. The pollen may be carried as a dry powder in a brush of hairs, or moistened with nectar to

form a clump or pellet. In general, bees are more hairy or fuzzy than their wasp kin. Those that are relatively bare lack the silvery reflective facial hairs that give a flashy face to some related wasps.



An alfalfa leafcutting bee. Notice the hairy appearance (as compared to wasps and yellow jackets).



Large, furry bees that are black and yellow are bumblebees.

Flower Fly: A number of harmless insects mimic the look of social bees and wasps. Most familiar among these are the flower flies (*Syrphidae*) whose resemblance to particular genera of social bees or wasps can be uncanny. Careful observation reveals diagnostic differences. Antennae of flower flies are short, having but a few segments terminating in a bristle; bees' antennae are multi-segmented, narrowly cylindrical and longer. Flower flies have but one pair of wings, bees have two pair. Flower flies often hover, unlike our bees. Flower flies, though often hairy, do not accumulate loads of pollen under their abdomens or on their hind legs as female bees do. Nonetheless, they can be significant pollinators. Finally, no flower fly can sting or bite, unlike the social bees or wasps that they mimic.



Flower fly (*Eristalis*) at goldenrod

Yellow Jacket: Yellow jacket wasps (*Vespula*) are often mistaken for bees. Indeed, some folks call them "meat bees", but they are in fact social wasps related to hornets and only distantly related to bees. Yellow jackets may on occasion visit flowers (or your water-melon slice) for sugar, but unlike bees, yellow jackets are carnivorous, eating insects, carrion and picnic fare. Hence, they have no brushes or pollen baskets for carrying pollen. They are relatively hairless and all resemble the one pictured here. Their nests are made of paper, not wax, typically built in shallow underground cavities. In only a few instances are they thought to be pollinators. Like honeybees and bumble bees, yellow jackets have a potent sting.



Yellow jacket eating plum

Honey Bee: Workers of the European honey bee (*Apis mellifera*) are undoubtedly the most familiar bees to North Americans. This is the bee whose perennial colonies are found in hollow trees and in the white wooden boxes managed by beekeepers for honey production and agricultural pollination. They are tan with varying degrees of orange or brown, more hairy than the yellowjacket, but less furry than the bumble bee. Like many bees, they transport pollen on their hind legs, but notably, their pollen is carried in a smooth, slightly concave pollen basket rather than in a dense brush of hairs. Their populations continue to suffer from two recent Old World afflictions, the Varroa mite and the tracheal mite.



Honey bee worker (*Apis mellifera*) at aster flower

Source of “Is it or isn’t it a bee” information: [USDA/ARS](http://www.usda.gov/ARS)

Learning / Inquiry Activities:

Ask students to pick out clues to physical appearance in each of the paragraphs above that would be distinguishing physical characteristics of the bee, yellow jacket, or flower fly. Chart the physical characteristics. Divide the class into 3 groups and instruct the students in each group to each make an illustration based upon the results of their reading and charting.

Guide for charting:

Bee: A bee differs from other floral visitors in having been fed pollen as a larva. If you see an insect **toting a load of pollen either on its hind legs or beneath its abdomen**, it is a female bee. The pollen may be carried as a dry powder in a brush of hairs, or moistened with nectar to form a clump or pellet. In general, bees are **more hairy or fuzzy than their wasp kin**. **Those that are relatively bare lack the silvery reflective facial hairs that give a flashy face to some related wasps.**

Honey Bee: Workers of the European honey bee (*Apis mellifera*) are undoubtedly the most familiar bees to North Americans. This is the bee whose **perennial colonies are found in hollow trees and in the white wooden boxes managed by beekeepers** for honey production and agricultural pollination. They are **tan with varying degrees of orange or brown, more hairy than the yellowjacket, but less furry than the bumble bee**. Like many bees, they transport pollen on their hind legs, but notably, **their pollen is carried in a smooth, slightly concave pollen basket rather than in a dense brush of hairs**. Their populations continue to suffer from two recent Old World afflictions, the Varroa mite and the tracheal mite.

Flower Fly: A number of harmless insects mimic the look of social bees and wasps. Most familiar among these are the flower flies (*Syrphidae*) whose resemblance to particular genera of social bees or wasps can be uncanny. **Careful observation reveals diagnostic differences**. **Antennae of flower flies are short, having but a few segments terminating in a bristle; bees' antennae are multi-segmented, narrowly cylindrical and longer**. Flower flies have but one pair of wings, bees have two pair. Flower flies often hover, unlike our bees. Flower flies, though often hairy, **do not accumulate loads of pollen under their abdomens or on their hind legs as female bees do**. Nonetheless, they can be significant pollinators. Finally, no flower fly can sting or bite, unlike the social bees or wasps that they mimic.

Yellow Jacket: Yellow jacket wasps (*Vespula*) are often mistaken for bees. Indeed, some folks call them "meat bees", but they are in fact social wasps related to hornets and only distantly related to bees. Yellow jackets may on occasion visit flowers (or your water-melon slice) for sugar, but unlike bees, **yellow jackets are carnivorous, eating insects, carrion and picnic fare**. Hence, **they have no brushes or pollen baskets for carrying pollen**. **They are relatively hairless** and all resemble the one pictured here. Their nests are made of paper, not wax, typically built in shallow underground cavities. In only a few instances are they thought to be pollinators. Like honeybees and bumble bees, yellow jackets have a potent sting.

Example of bee drawing:

