2018

Mimicry in Insects: An Illustrated Study in Mimicry and Cryptic Coloration in Insects

Merrie Schultz

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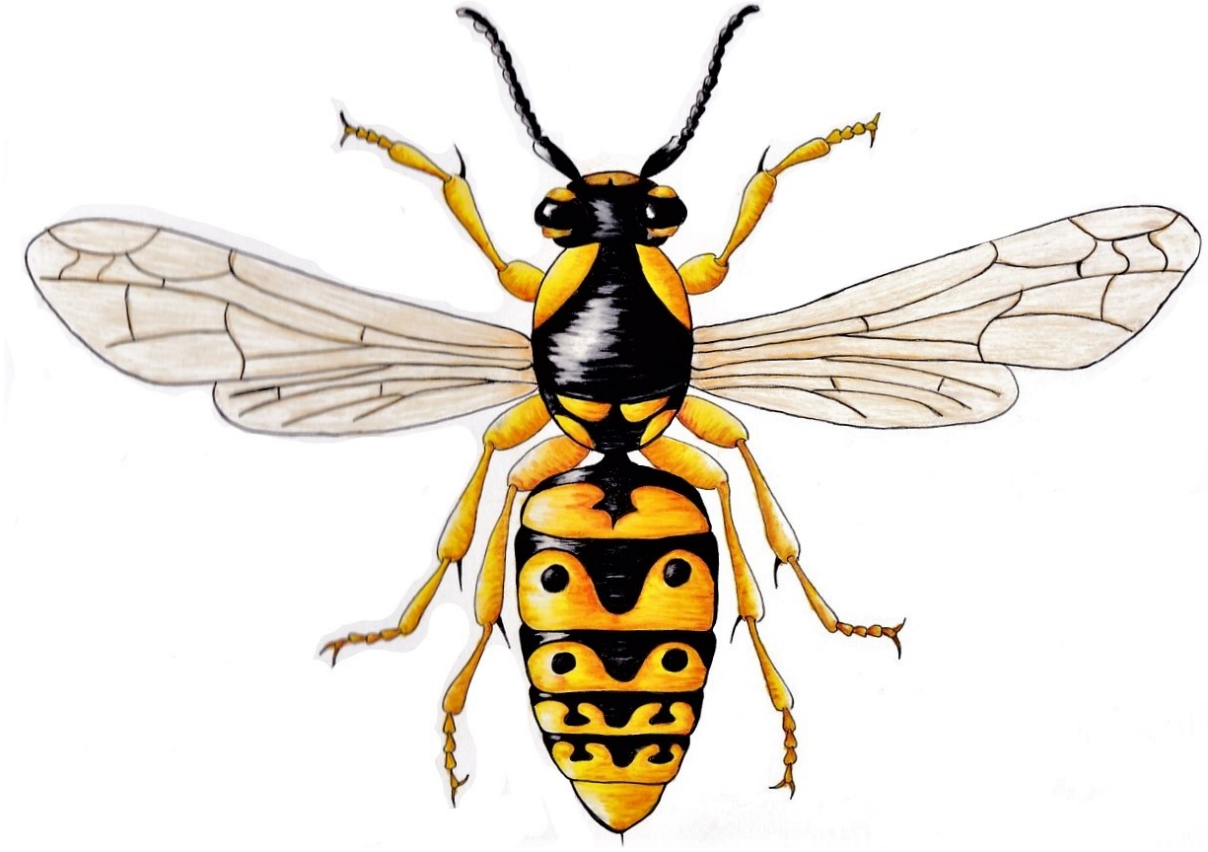
An Illustrated Study in Mimicry and Cryptic Coloration in Insects



Written & Illustrated by

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Dedication

To My Family

One of my earliest memories is running around the backyard, flipping over rocks, and studying all the little bugs. Thank you for encouraging me to explore!!

And for Matthieu

Thank you for being with me through this creative process and for your unwavering enthusiasm toward every bug drawing I sent you.

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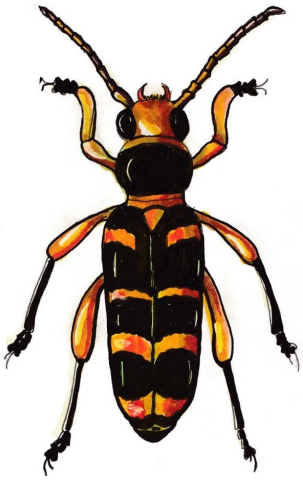
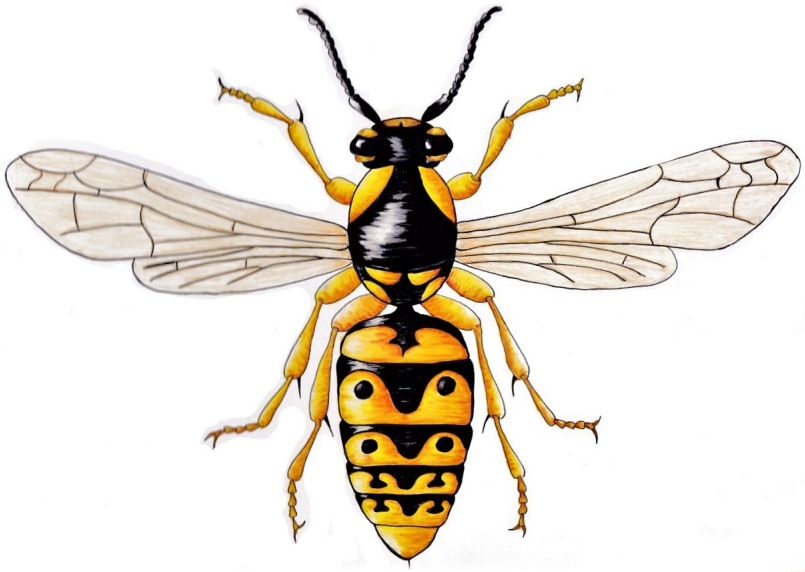
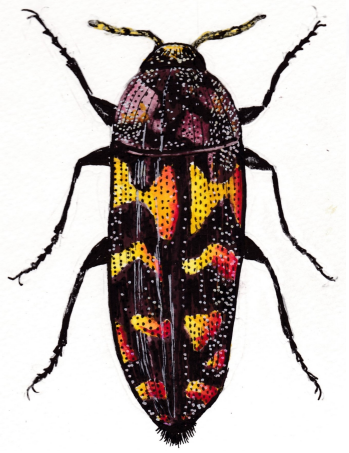
Insect Mimicry

In Evolutionary Biology, mimicry occurs when one organism copies the physical and/or behavioral traits of another organism in order to receive a selective advantage.

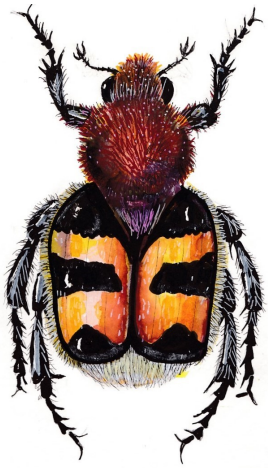






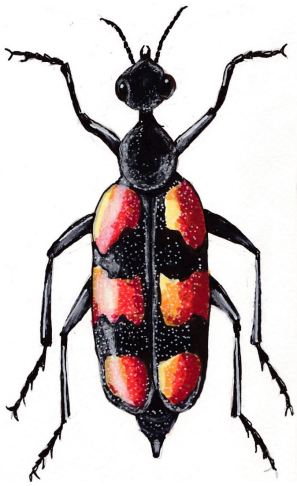
Müllerian Mimicry

Mullerian mimicry occurs when two or more harmful insect species have adapted to display like colors and patterns.



Batesian Mimicry

Batesian Mimicry occurs when a harmless/palatable insect looks like and acts like a harmful/unpalatable insect in order to avoid predation.



What is Mimicry?

Mimicry, extremely common in insects, has long held the fascination of the scientific community. Most significantly, it provides a clear illustration for the processes identified by Charles Darwin in his Theory of Natural Selection, but it can also reveal evolutionary relationships within populations and between organisms. As nature selects for traits that are advantageous in a given environment, mimicry helps us to clearly identify those traits as they can provide a successful advantage across species.

Evolutionary Biologists define mimicry as one organism replicating the physical and/or behavioral traits of another organism. Mimicry can be inter- or intraspecific, occurring between individuals within the same species or between different species. Mimicry is typically the result of some type of selective pressure in nature that favors a characteristic of evolutionary advantage within the population of one organism, and over time a second organism, often within the same environmental context, evolves to display similar traits that make it better adapted for that environment. Part of the adaptive advantage that is conferred on the secondary organism is one of deception. That is, the secondary organism can fool predators/prey/mates that they are similar to the first organism.

For example, mimicry can begin when a harmful insect evolves to display bright colors as a warning to predators that it is toxic and unpalatable. This is known as *aposematic coloration*. This is seen in a wide variety of potentially harmful insects, such as the monarch butterfly which has bright orange and red wings. The bright coloring warns potential predators that the butterfly is extremely foul tasting. The Viceroy Butterfly displays the same coloring, which may signal to predators the same message. Another example of aposematic coloration can be found in the velvet ant, also known as the cow killer. Its bright red/orange markings warn predators that the ant has a painful bite and sting.

Over time noxious insects of the same or differing species evolved to display similar color patterns, seen in bees and wasps, which have consequently led to the adoption, by harmless insects, of physical traits like those of the noxious insects.

Many harmless mimics will also copy the behaviors of the harmful insects as well. This includes how they fly, walk, or how they move when they feel threatened. For example, drone flies can make the same buzzing noise as honey bees, so they not only look like a honey bee in shape and color, but they also sound like them in flight. This similarity encourages their predators and/or other harmful organism to avoid them.

There are a variety of mimetic strategies on display in the insect world:

Müllerian Mimicry -- Many poisonous insects will display similar types of bright colors or color patterns which indicates to other predatory organisms to avoid all insect species that share that same color or color pattern.

Batesian Mimicry – Many harmless insects protect themselves by displaying similar colors and patterns of poisonous insects or other predatory animals.

Cryptic Coloration /Camouflage -- Some insects use *cryptic coloration*, a form of camouflage, to blend in with the rocks, leaves or the substrate they live among in order to avoid predators.

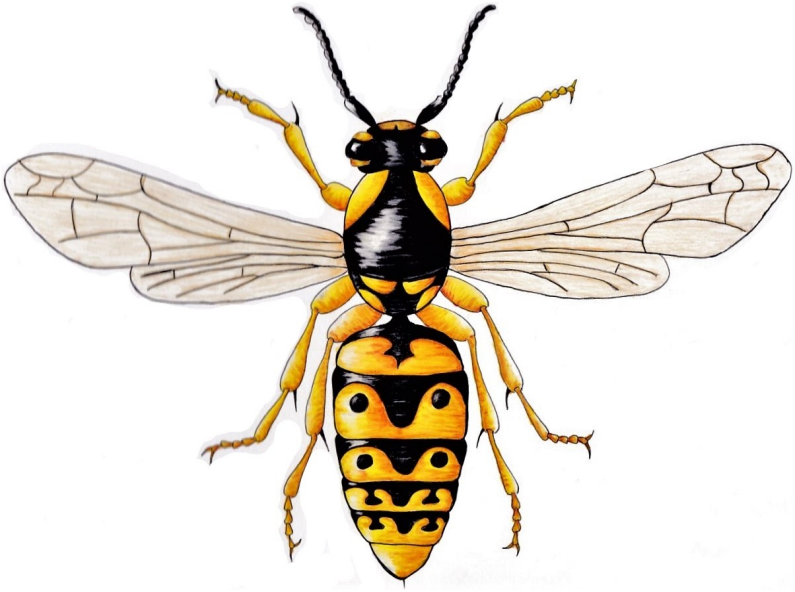
Müllerian Mimicry

Müllerian Mimicry occurs when unrelated harmful or noxious insects appear to share the same color/color patterns and/or behavioral characteristics. The selective advantage—often avoidance by predators — is shared by the whole group of like insects.

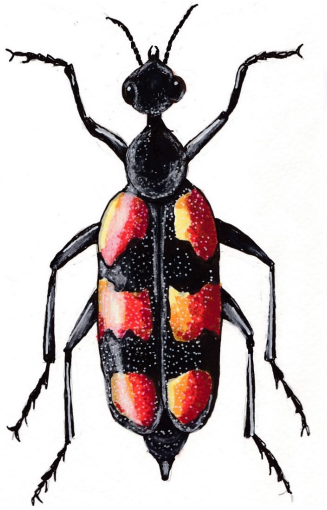
The insects on this page are all harmful or noxious. They benefit from their like coloring/color patterns as predators will avoid them all as a category. It is theorized that the Yellowjacket provides the evolutionary bases for the bright orange and yellow/red and orange patterns exhibited in all of these species.

Apis spp.
"Honey Bee"

Ammophila spp.
"Thread-waisted Wasp"



Vespula spp.
"Yellowjacket"



Eupompha elegans perpulchra
"Blister Beetle"

Dasymutilla occidentalis
"Velvet Ant"

Bombus spp.
"Bumble Bee"

Limentis spp.
"Viceroy Butterfly"

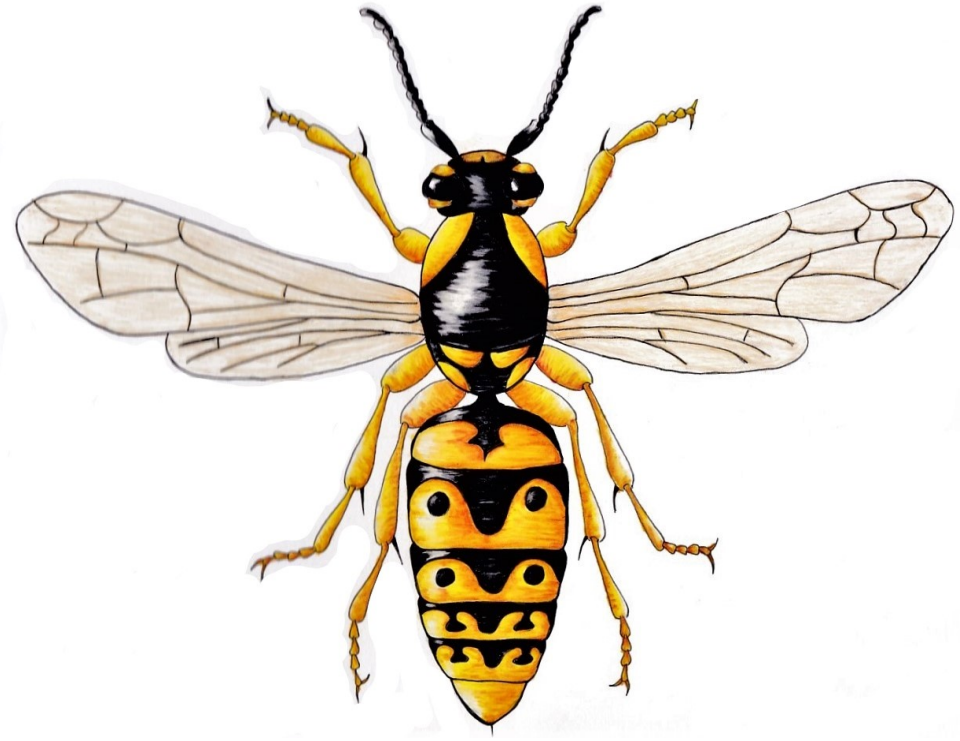
Danaus Plexidppus
"Monarch Butterfly"

Müllerian Mimicry

Named after the German Naturalist Fritz Müller, Müllerian Mimicry occurs when two or more harmful insect species have adapted to display like colors and patterns. This indicates to predators that any insect with these types of markings are poisonous and should be left alone. Noxious insects that resemble each other often have the same predators, by signaling similar colors and patterns and even behavioral traits, all insects within the display category indicate to predators that these shared traits indicate toxicity and should be avoided. They are thus sharing an evolutionary advantage across species, but also sharing the evolutionary cost – in this case the "cost" occurs when a few individuals are sampled by predators within the display community and the predators "learn" from the sample that this color pattern is to be avoided.

Müllerian mimicry is common among stinging Hymenopterans (Bees, Wasps, and Ants). The yellow, orange, and black banding of honey bees, bumblebees, yellow jackets, and other wasps is easily recognized and serves as a warning that this group of insects as whole is potentially harmful if disturbed. Predators associate the colors and patterns with aggressiveness and toxicity and are not likely to eat anything that exhibits these warning colors. From an evolutionary perspective, the whole group of like colored insects is sharing the selective advantage that predators learn by associating a harmful interaction with just a few of these colored insects. This is true for humans as well, as children we learn to associate these colors and patterns with a very painful sting that was the result of our first encounter and so many of us grow up with a healthy fear of anything that looks like it may be one of these stinging insects.

Yellowjacket



Hymenoptera: Vespidae

Vespula spp.

Description: Adult Yellowjacket

I. Size: 12-16mm in length
II. Yellow banding on abdomen
III. Face is primarily yellow with big dark brown or black eyes.
IV. Long slender antennae
V. Wing are long and slender and fold lengthwise when at rest.

Distribution:

I. Found Worldwide.
II. Common in North America.

General Information:

I. Often mistaken for bees, paper wasps and hornets because of their similarities in size, shape and color.
II. They are a common nuisance at outdoor activities especially when food is available.
III. Yellowjackets are aggressive and extremely territorial.

Type of Mimicry: Müllerian Mimicry

I. Similar color and patterns to other stinging insects in the Order Hymenoptera (Honeybees, Bumble-bees, Paper Wasps, Hornets, etc)
II. A variety of harmless insects have evolved to mimic the coloration and markings of yellowjackets in order to avoid predation.
III. The yellow and black coloration and markings of yellowjackets serve as a warning to other organisms that they are potentially harmful.
IV. Non-sting yellowjacket mimics include:
    a. Longhorn flower beetle
    b. Wasp Beetle
    c. America Hornet moth.
    d. Hover Fly

Honey Bee

Description: Adult Honey Bee

I. Size: 9-20mm in length.
II. Robust and fuzzy body.
III. Yellow/orange and black markings on body.
IV. Elbowed Antennae.

Hymenoptera: Apidae

Apis melifera

Distribution:

I. Common in North America.

General Information:

I. Honey bees are the world's most important pollinators and are responsible for pollinating many of our agricultural crops. They are also common visitors to a wide variety of flowering plants.
II. Honey bees are docile by nature but will sting if disturbed. Worker honey bees have a barbed stinger and are only able to deliver a single sting unlike their wasp cousins. Once inserted in the skin, the stinger stays in place as the honey struggles to free itself. This typically results in its death. The queen honey bee does not have a barbed stinger and so she is able to sting multiple times. Drone honey bees do not have a stinger.
III. Due to relative similarities honey bees and bumblebees are often mistaken for one another.

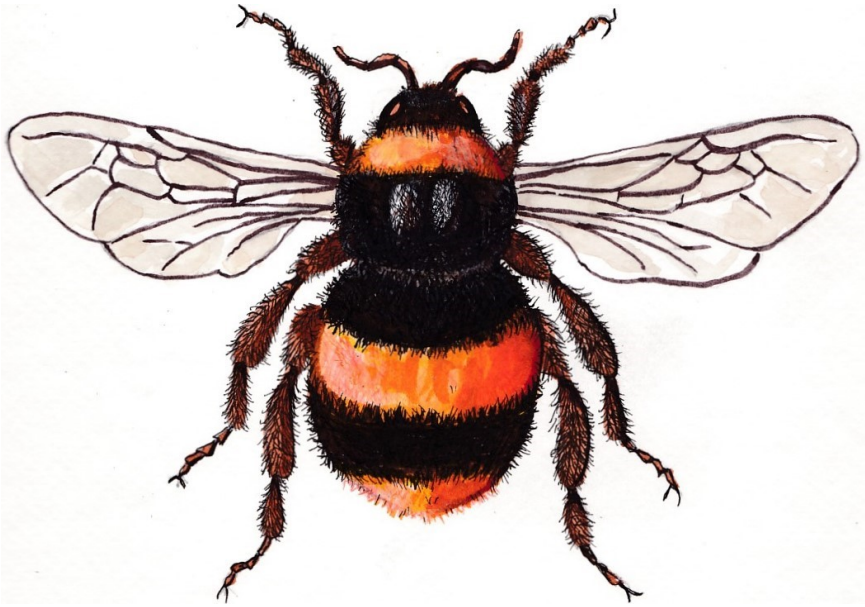
Type of Mimicry: Müllerian Mimicry

I. Similar color and patterns to other stinging insects in the Order Hymenoptera (Bumblebees, Paper Wasps, Hornets, etc.)
II. Similar physical appearance including size, shape, color and patterns to other stinging insects in the Order Hymenoptera (Bumblebees, Paper Wasps, Hornets, etc.)

Bumble Bee

Description: Adult Bumble Bee

I. Size: 10-24mm in length.
II. Robust and fuzzy body.
III. Black and yellow (sometimes orange) and/or white banding.
IV. Elbowed antennae.
V. Wing are lay flat over abdomen when at rest.



Distribution:

I. Found Worldwide.
II. Common throughout North America.

General Information:

I. Due to relative similarities bumblebees and honey bees are often mistaken for one another.
II. Bumblebees are docile in nature but will sting when threatened. Unlike honey bees, bumblebees have the ability to sting multiple times.
III. Bumblebees are important pollinators of Agricultural crops and ornamental plants.

Hymenoptera: Apidae

Bombus spp.

Type of Mimicry: Müllerian Mimicry

I. A variety of non-stinging insect's mimic bumblebees in size, body shape, and their overall fuzzy appearance. By mimicking the appearance of the bumblebee these harmless insects are protected from predators that associate the colors and marking with potentially harmful bumblebees.
II. Bumblebee Mimics:

- Bee Beetle.
- American Hornet Moth.
- Bee Fly.
- Snowberry Clearwing Moth

Velvet Ant (Cow Killer)

Description: Adult (Cow Killer)

I. Size: 15-25mm in length.
II. Red/Orange and black markings on body.
III. Body covered in dense hairs.
IV. Elbowed antennae.
V. Males are winged. Females are wingless.

Distribution:

I. Typically found in Southern States of North America
II. Also, found in the South Eastern States of North America.

General Information:

I. Velvet ants are not ants at all. They are in fact a type of solitary wasp.
II. The females are wingless and can be quite territorial. Their sting is quite painful, so it is wise not to handle of disturb them. The males have wings and look more like a typical wasp in shape and size.
III. Velvets ants can be found in lawns and in the soil in household gardens.
IV. The velvet ant's bright colors warn other organisms that they are aggressive and potentially harmful if bothered. This is known as *aposematic coloration.*

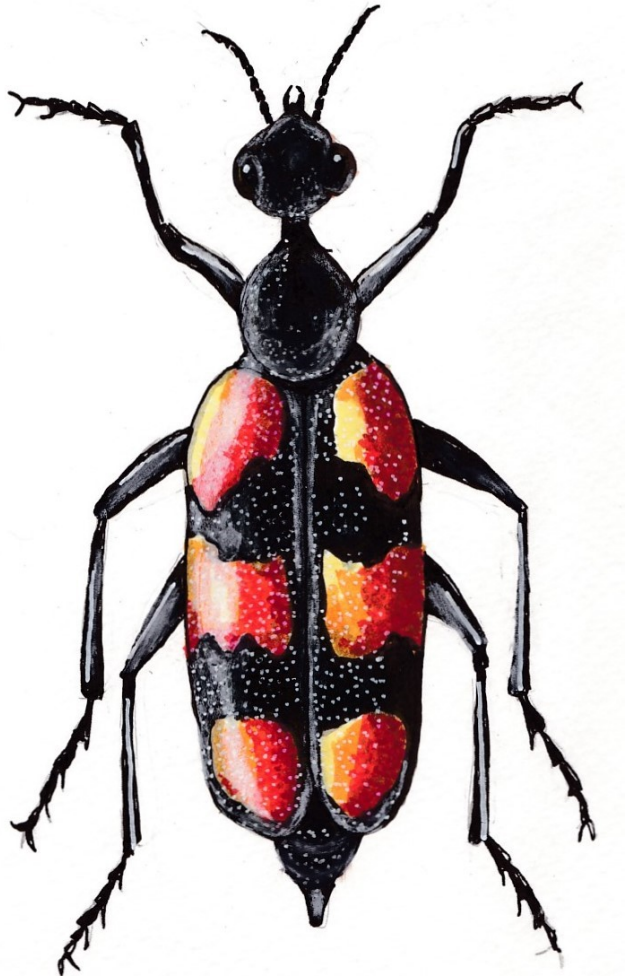
Hymenoptera: Mutillidae

Dasymutilla occidentalis

Type of Mimicry: Müllerian Mimicry

I. Similar color and patterns to other stinging insects in the Order Hymenoptera and Coleoptera (thread wasted wasp, and blister beetle).
II. Non-Stinging insects mimic the velvet ant's bright colors to avoid predation.
III. Color mimics include the Tachinid Fly.

Blister Beetle



Coleoptera: Meloidea

Eupompha elegans

Description: Adult Blister Beetle

I. Size: 7-15 mm in length.
II. Elongated body.
III. Red and black, orange and black, and yellow and black markings on elytra depending on the morph.
IV. Long slender antennae.

Distribution:

I. Arid regions of South Eastern US

General Information:

I. Blister Beetles can be found on a wide variety of flowering plants and grasses and are commonly found in alfalfa. This can be dangerous for horses and other livestock.
II. When squeezed or crushed blister beetles release *cantharidin* which upon contact with skin causes painful blistering.

Type of Mimicry: Müllerian Mimicry

I. Many species of blister beetles exhibition bright colors and a warning to predators that they are potentially harmful.
II. Similar color and patterns to other stinging and noxious insects in the Order Hymenoptera (thread wasted wasp, and Velvet Ant).

Thread-waisted Wasp

Hymenoptera: Sphecidae

Ammophila spp.

Description: Adult Thread-waisted wasp

I. Size: 10-30mm in length.
II. Glossy black with red/orange on abdomen, and legs. Can be all black or have yellow and black or yellow and brown markings.
III. Abdomen starts out extremely narrow waist and ends in a stout bulb.
IV. Short elbowed antennae.
V. Long legs.

Distribution:

I. Found Worldwide.
II. Common in North America.

General Information:

I. The thread-waisted wasp's appearance is quite distinct, and it is hard to mistake it. However, there are a few Conopid flies that have a similar body shape and may be mistaken for a thread waisted wasp.
II. Thread waisted wasps are common visitor to garden flowers and wild flowers.

Type of Mimicry: Müllerian Mimicry

I. Similar color and patterns to other stinging insects in the Order Hymenoptera and Coleoptera (thread Velvet ant, and blister beetle).
II. Thread-waisted wasps can use their bright coloration to warn other organisms that they are aggressive and potentially harmful if bothered. This is known as **aposematic coloration.**
III. Non-Stinging insects mimic the bright colors of the thread-waisted wasp to avoid predation.
IV. Color mimics include the Tachinid Fly.

Monarch Butterfly

Description: Adult Monarch Butterfly

I. Size: 8.9-10.2 cm Wingspan
II. Wings are red/orange, with white spots, and black vein-like borders.
III. Body long and thin. Primarily black in color with some white markings
IV. Long Slender antennae

Lepidoptera: Nymphalidae

Danaus plexippus

Distribution:

I. Found throughout North America.

General Information:

I. Monarch butterflies are distinct in their appearance and aside from a few mimics they are easily identified.
II. Males and females are similar in appearance. The females have thicker black vein markings on the wings and the males have a visible pheromone pouch on their hindwings.
III. The Monarch caterpillar feeds exclusively on Milkweed. As it feeds it stores alkaloids that give it a foul taste. Enough of the alkaloids are present in the adult Monarch to make it unpalatable to predators as well.
IV. Monarch butterflies display bright colors to warn predators that they are foul tasting and that they should be avoided.
V. Monarch butterflies are well known for the 3,000 plus mile migration that some of them make from Southern Canada to Northern Mexico.

Type of Mimicry: Müllerian Mimicry

I. Use of bright colors as a warning to predators that they are foul tasting.
II. Similar species – Viceroy Butterfly.

Viceroy Butterfly

Description: Adult Viceroy Butterfly

I. Size: 6.3-8.6cm wingspan.
II. Wings have red/orange with white spots and black vein markings.
III. Body is black and long and slender.
IV. Antennae are long and slender.

Distribution:

I. Found throughout North America and Mexico.

General Information:

I. Viceroy butterflies are similar in appearance to Monarch butterflies. Notable differences are that the Viceroy has a smaller wingspan and hindwings have a postmedian black line that runs across the veins.

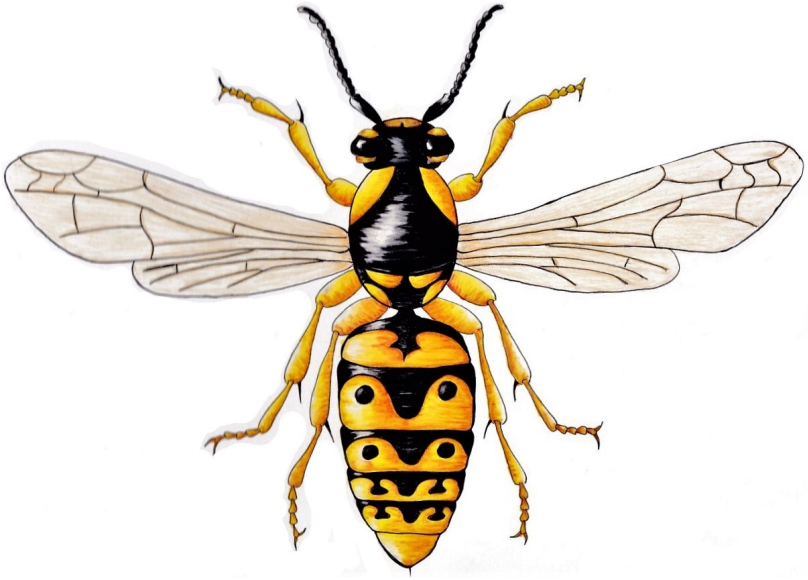
Lepidoptera: Nymphalidae

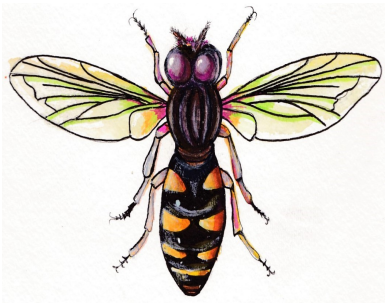
Limentis spp.

Type of Mimicry: Müllerian Mimicry

I. Uses bright colors and patterns to warn predators that it is unpalatable.
II. Similar species – Monarch Butterfly.
III. Viceroy Butterflies have long been thought to be a Batesian mimic of Monarch butterflies. However recent studies have shown that the Viceroy butterfly may be just as unpalatable to predators. This would mean the viceroy is displaying Mullerian mimicry.

Typocrerus spp.
"Flower Longhorn Beetle"



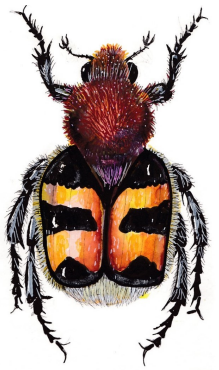


Eupeodes spp.
"Hover Fly"

Batesian Mimicry

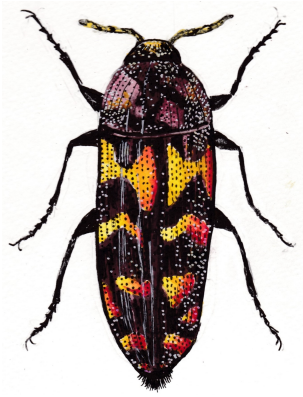
As with the shared adaptive advantage that harmful insects share by displaying the similar colors/patterns/behaviors, harmless insects can use the same *conspicuous coloration* to avoid predators. This is called **Batesian Mimicry**.

All of the insect on this page benefit from displaying the same color/color patterns or, as with the Bee Fly and the Tachinid Fly, the same behavior patterns as the Yellowjacket (above), the Honey Bee, and the Bumble Bee. They are all, however, harmless, but benefit from the shared association.

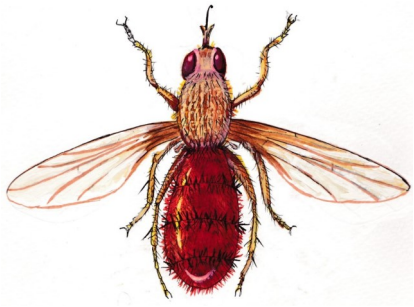


Trichius spp.
"Bee Beetle"

Eristalis spp.
"Drone Fly

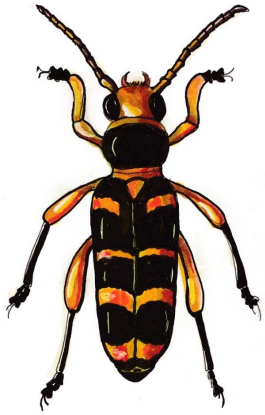


Acmaeodera spp.
"Metallic Woodboring Beetle"



Cylindromyia spp.
"Tachinid Fly"

Sessia spp.
"American Hornet Moth"



Clytus spp.
"Bee Beetle"

Hemaris diffinus
"Snowberry Clearwing Moth

Bombylius spp.
"Bee Fly"

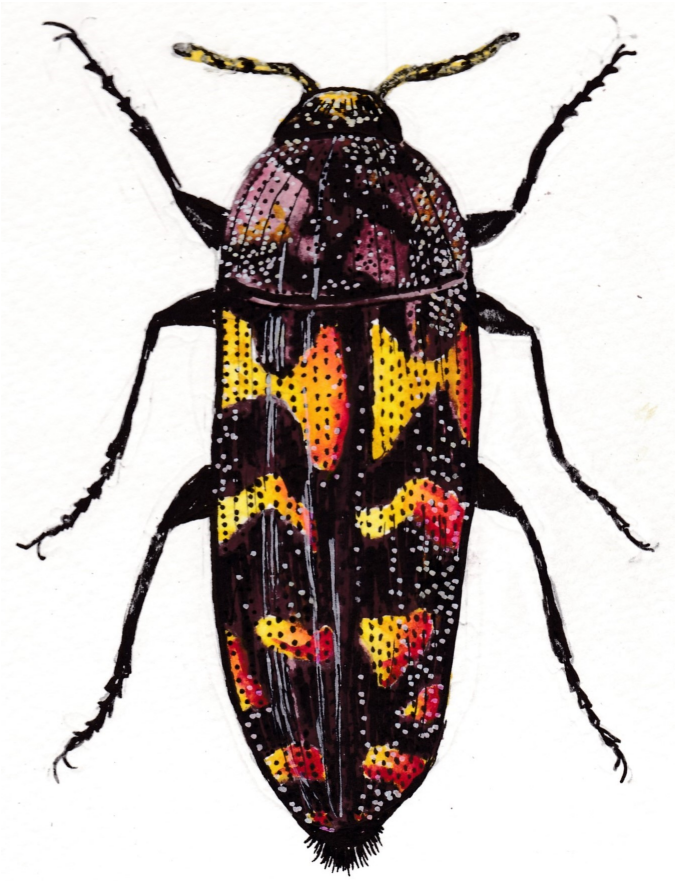
Batesian Mimicry

Named after the English Naturalist Henry Walter Bates, ***Batesian Mimicry*** occurs when a harmless/palatable insect looks like and acts like a harmful/unpalatable insect. Harmless insects that mimic harmful insects are protected by the innate and learned behaviors of predatory organisms that associate certain colors and patterns with aggressive behavior and/or toxicity. Over time harmless prey insects that share that the same environmental and predatory pressures as a poisonous or noxious insect evolve to show similarly bright colored patterns, and by doing so they gain a little extra protection against predation by looking like the insect that a predator associates with being harmful or unpalatable.

Batesian Mimicry occurs in variety of species in many different insect Orders including Diptera (flies, gnats, midges, mosquitoes), Coleoptera (Beetles), Lepidoptera (Butterflies and Moths) and many more. *Batesian Mimicry* comes in many forms. Some insects look like stinging insects such as wasps and bees or they can look like other non-insect predators such as snakes or even have spots on their wings that look like the eyes of an owl.

The snowberry clearwing moth is a diurnal moth that resembles a large bumblebee. It's black and yellow markings and the way it hovers as it feeds on the nectar of flowering plants makes it easy to mistake it for a bumblebee out collecting nectar. The bright colors and other physical traits being mimicked fool predators in to thinking that this otherwise palatable insect is toxic and should not be consumed. Often, predators are not likely to discern between poisonous and non-poisonous insects so they avoid the category of insects with like coloration or behavioral patterns as a whole.

Metallic Woodboring Beetle



Coleoptera: Buprestidae

Acmaeodera spp.

Description: Adult Buprestid Beetle

I. Size: 5-15 mm in length.
II. Small elongated body.
III. Yellow and black, or red and black markings on elytra. Metallic green or black elytra are also common.
IV. Serrate antennae.

Distribution:

I. Found through out North America.

General Information:

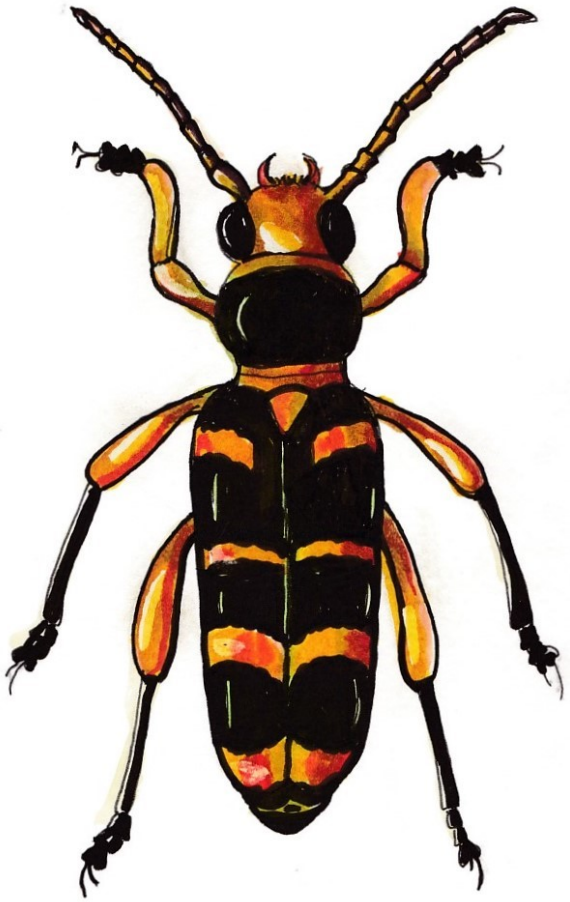
I. Commonly found feeding on a variety of flowers and plant foliage.
II. Physical features that can be used to distinguish them from bees and wasps include:

- Wings covered by elytra
- Serrate antennae that are not elbowed.

Type of Mimicry: Batesian Mimicry

I. Buprestid beetles in the genus *Acmaeodera* have fused elytra which gives them the appearance of tiny bees or wasps when they fly. This along with their yellow and black coloration make it easy to confuse them with wasps or bees.
II. Similar Batesian Mimics include the Flower Longhorn Beetle, the Wasp Beetle, the Hover Fly, and the American Hornet Moth.

Wasp Beetle



Coleoptera: Cerambycidae

Clytus spp.

Description: Adult Wasp Beetle

I. Size: 9-18mm in length.
II. Elongated body.
III. Yellow and black marking on body and elytra.
IV. Long slender antennae.

Distribution:

I. Found in Europe, Russia, and parts of Asia.

General Information:

I. Adults are found feeding on a variety of flowering plants.
II. Physical features that can be used to distinguish the wasp beetle from wasps include:

- Long slender antennae
- Wings covered by elytra
- Do not have thin waist common in wasps.

Type of Mimicry: Batesian Mimicry

I. Wasp beetles are easily mistaken for wasps due to their similar markings and physical appearance.
II. Similar Batesian Mimics include the Flower Longhorn Beetle, the Wasp Beetle, the Hover Fly, and the American Hornet Moth.

Flower Longhorn Beetle

Coleoptera: Cerambycidae

Typocerus spp.

Description: Adult Flower Longhorn Beetle

I. Size: 9-14 mm in length.
II. Elongate body.
III. Yellow and black, yellow and brown or red markings on elytra.
IV. Antennae are long and slender. Often time as long as the body.

Distribution:

I. Found through out North America.

General Information:

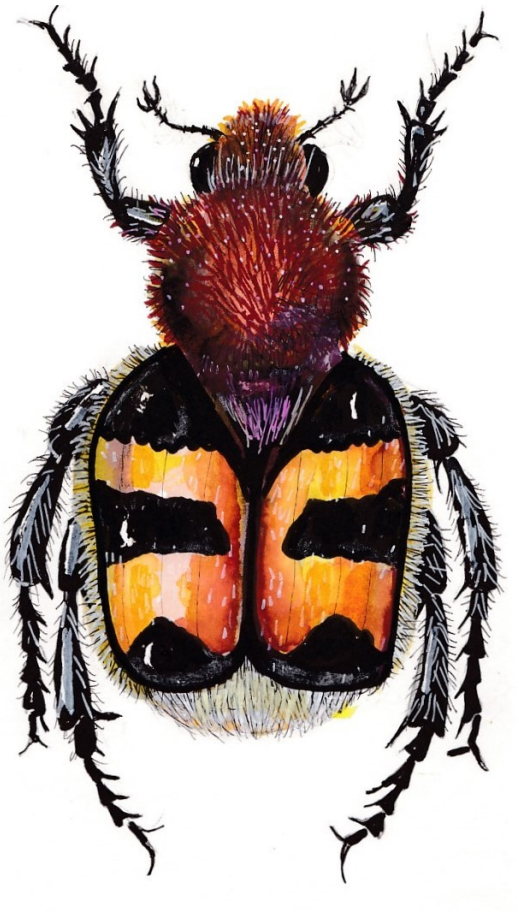
I. Flower Longhorn Beetles are common visitors to a variety of flowering plants.
II. Physical features that can be used to differentiate between the Flower Longhorn Beetle and wasps include:

- Flower longhorn beetles do not have the thin waist commonly seen in wasps
- They have extremely long antennae.
- They have elytra covering their wing.

Type of Mimicry: Batesian Mimicry

I. Their color and shape make it easy to confuse them with wasps and other stinging insects.
II. Avoids predation by mimicking the physical characteristics of poisonous and stinging insects.
III. Similar batesian mimics include the Wasp Beetle, the American Hornet Moth, and the Hover Fly.

Bee Beetle



Coleoptera: Scarabaeidae

Trichius spp.

Description: For Adult Bee Beetle

I. Size: 8-12mm in length.
II. Small stout body covered in dense hairs.
III. Yellow/orange and black markings on elytra.
IV. Antennae are short and clubbed.

Distribution:

I. Found through out Europe and parts North America.

General Information:

I. Due to their similarities in size, shape and color, bee beetles are easily mistaken for bumblebees.
II. Common visitor to a variety of flowering plants
III. Physical features that can be used to tell Bee Beetles and Bumblebees apart:
- Bee beetles have short clubbed antennae
- Wings of the bee beetle are covered by the elytra.

Type of Mimicry: Batesian Mimicry

I. Bee Beetles avoid predation by mimicking the physical characteristics of the bumblebee.
II. Similar Batesian mimics include the Bee Fly and the Snowberry Clearwing Moth.

Bee Fly

Description: For Adult Bee Flies

I. Size: 14-18mm in length.
II. Body is stout and fuzzy, covered in fine hairs.
III. Long rigid proboscis extends forward from the head.
IV. 1 pair of wings
V. Antennae are short and not easily seen.

Diptera: Bombyliidae

Bombylius spp.

Distribution:

I. Common in Temperate Regions of North America.

General Information:

I. Bee Flies are fast and agile flies and are typically seen darting around just above the ground.
II. Bee Flies have a long rigid proboscis that protrudes forward from its head. While it may look intimidating, it is completely harmless.
III. Physical Features that can be used to distinguish Bee Flies from Bumblebees and honey bees include:

- Bee Flies have short antennae that are not easily seen at a glance.
- They have a long proboscis extending forward form its head.
- They havve a single pair of wings.

Type of Mimicry: Batesian Mimicry

I. Their stout furry body and the buzzing noise made by their wings make it easy to mistake them for Bumblebees.
II. Batesian Mimics with similar characteristics include the Bee Beetle and the Snowberry Clearwing Moth.

Drone Fly

Description: For Adult Drone Fly

I. Size: 13-15mm in length.
II. Yellow/gold and black marking on body.
III. 1 pair of wings.
IV. Antennae are short and not easily seen at a glance.

Diptera: Syrphidae

Eristalis spp.

Distribution:

I. Common throughout North America.

General Information:

I. Drone Flies are common visitors to a wide variety of flowering plants.
II. Drone Flies are relatively robust with a small amount of hair on their body. Due similarities in color shape, and size, they are easy to mistake for bumblebees and honey bees.
III. Features that can be used to differentiate between Drone Flies and Honey Bees/ Bumblebees include:

- Drone flies have short antennae not easily seen at a glance.
- They have large eyes that take up most of their head.
- They have one pair of wings.

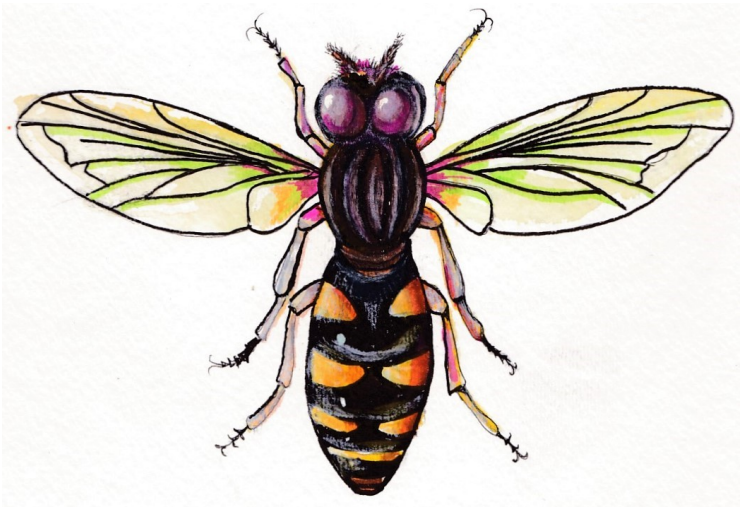
Type of Mimicry: Batesian Mimicry

I. Drone Flies avoid predation due their physical similarities to honey bees and bumbles bees.
II. Similar Bumblebee mimics include the Bee Beetle and the Snowberry Clearwing Moth.

Hover Fly

Description: Adult Hover Fly

I. Size: 9-14mm in length.
II. Yellow/gold and black marking on abdomen.
III. 1 pair of wings.
IV. Large eyes
V. Antennae are short.



Diptera: Syrphidae

Eupeodes spp.

Distribution:

I. Common throughout North America.

General Information:

I. Hoverflies are common pollinators and are usually seen hovering around flowering Plants.
II. Physical features that can be used to distinguish hover flies for wasps include:

- Hover flies do not have thin waist commonly seen in wasps.
- They have extremely short antennae in comparison to those of wasps.
- Hoverflies have one pair of wings instead of two.
- Hoverflies have larger eyes that take up most of their head.

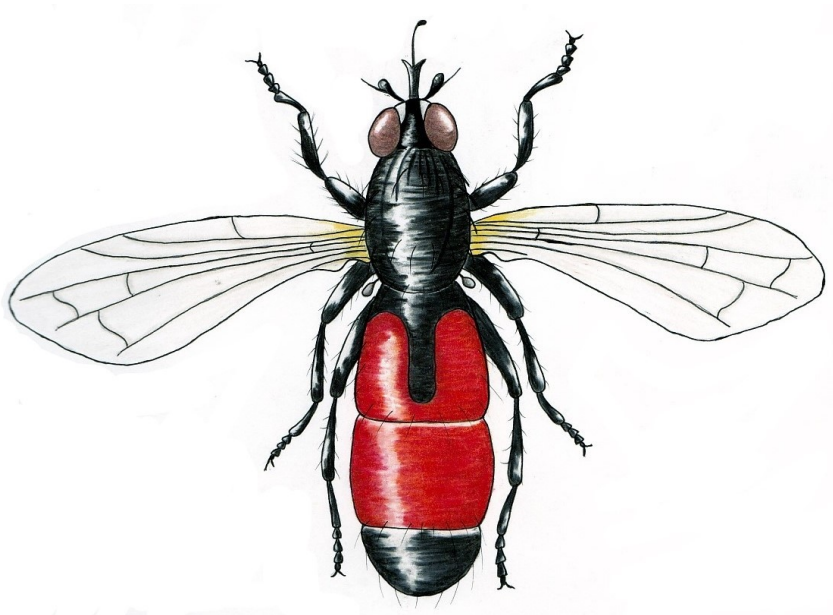
Type of Mimicry: Batesian Mimicry

I. Due to their similarities in color and relative shape hover flies are easily mistaken for wasps.
II. Hover flies avoid predation by mimicking the bright colors and patterns of wasps.
III. Similar wasp mimics include the Drone Fly, the Wasp Beetle, and the Longhorn flower beetle.

Tachinid Fly

Description: Adult Tachinid Fly

I. Size: 7-14 mm in length.
II. Color is variable Depending on species. Black and red, solid reddish/brown, back yellow markings on abdomen.
III. 1 pair of wings
IV. Large eyes.
V. Short antennae.



Distribution:

I. Common throughout North America.

General Information:

I. Tachinid Flies are typically parasitic in nature, but they are common visitors to a wide variety of flowering plants.
II. Physical features that can be used to distinguish the tachinid fly from the common thread-waisted wasp include:

- Short antenna
- 1 pair of wings

Diptera: Tachinidae

Cylindromyia spp.

Type of Mimicry: Batesian Mimicry

I. The Tachinid Fly's false "waist" and red abdomen make it easy to mistake with the common Thread-waisted Wasp.
II. Mimics the bright colors and patterns of poisonous insects decreasing it chances of predation.

Snowberry Clearwing Moth

Description: Adult Snowberry Clearwing Moth

I. Size: 32-51mm in length.
II. Robust fuzzy body.
III. Black and yellow/green markings on abdomen.
IV. Wings borders are dark brown/ black. The rest of the wing is clear due to a lack of scales.
V. Long slender antennae.
VI. Small eyes

Distribution:

I. Found throughout the Great Lakes and Eastern Regions of North America.

General Information:

I. Snowberry Clearwing moths are diurnal and so are mostly active during the day and early part of the evening.
II. They are commonly found in open fields and gardens where flowering plants are abundant
III. Its long antennae, long bordered

Lepidoptera: Sphingidae

Hemaris diffinis

Type of Mimicry: Batesian Mimicry

I. Due to their robust fuzzy body and black and yellow/Green markings, and because they are common visitors to the same types of flowering plants. Snowberry Clearwing Moths are often mistaken for bumblebees. By mimicking the physical appearance of bumblebees, the Snowberry Clearwing reduces it chances of predation.
II. Other Bumblebee mimics include the Bee Beetle and the Bee Fly.

American Hornet Moth

Description: Adult American Hornet Moth

I. Size: 22-26mm in length
II. Black and yellow or Black and red markings on body
III. Body covered with fine hairs
IV. Border of the wing is light brown. Interior portion of the wing lacks scales and is clear.
V. Antennae are long and slender.

Lepidoptera: Sesiidae

Sesia spp.

Distribution:

I. Found throughout North America.

General Information:

I. Commonly found in open areas such as fields and golf courses.
II. American hornet moths lack the slender waist common in wasps and hornet. This is a feature that can be used to tell whether you are looking at a wasp or its mimic.

Type of Mimicry: Batesian Mimicry

I. The American Hornet moth bears a striking resemblance to wasps and hornets not only in physical appearance but in behavior as well. When disturbed, the American Hornet Moth copies the erratic or "jerky" flight pattern of a disturbed wasp. It is also able to recreate the drone buzzing noise as well.
II. Other Wasp mimics
- Hover Fly
- Drone Fly
- Wasp Beetle
- Longhorn Flower Beetle

Cryptic Coloration & Camouflage

Cryptic Coloration and Camouflage

Cryptic Coloration is a form of camouflage. In insects, this includes the use of colors, patterns, and textures to blend in with their surroundings, to avoid predators by looking like part of their environment. Alternatively, an organism can ambush prey by hiding in plain site, blending with the surrounding environment and await their unsuspecting prey. Examples include: Lacewing larvae that actively cover themselves with tiny debris particles to further blend in with their surroundings; Praying Mantids that are green or brown in color, blending in with the leaves of the plants they are surrounded by; and the Flower Praying Mantis that looks like an orchid flower. It uses its camouflage as a method to attract prey. Many insect pollinators have been shown to be just as attracted to the pink coloration and elaborate display of a Flower Mantis lying in wait as they are to actual flowers. This type of ***cryptic coloration*** is known as *aggressive mimicry*.

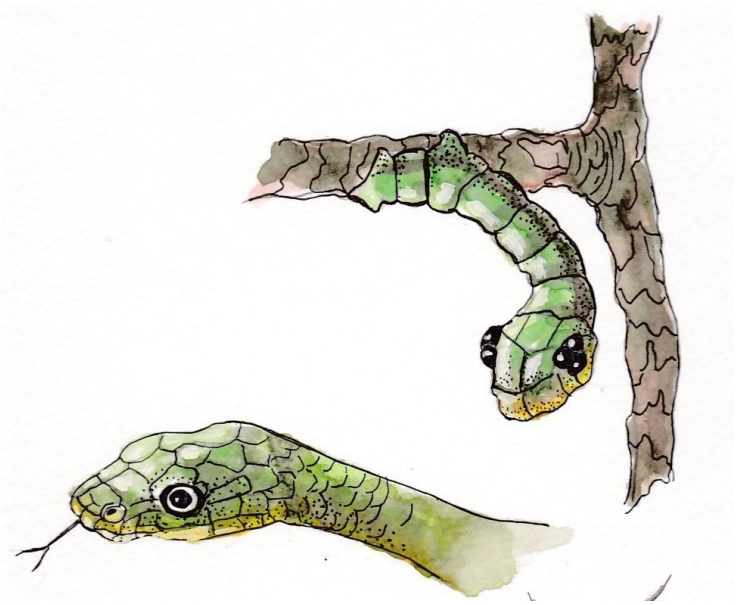
Walking sticks in the Order Phasmatodea look like the twigs and sticks that they are found on and some species even look like they have moss growing on them. Katydids in the Oder Orthoptera look like leaves they live among not only in shape, but their wings also look like the venation on the leaves. Some Katydids look like dead or dying leaves with green and brown markings, some have areas on their wings that look like fungus spots or areas that have been chewed away by insect herbivores.

Both Predators and Prey use ***cryptic coloration*** and a variety of other morphological and behavioral adaptations in the hopes of remaining undetected. Predators use camouflage to remain unseen while they lie in wait to ambush unsuspecting prey, while many prey organisms use

camouflage to hide themselves from predators that are on the hunt.

Insects are masters of disguise. Many species have evolved to blend in with parts of their environment. Insects can blend in with their surrounding and hide in plain sight by resembling, leaves, flowers, tree bark, dirt, sand, rocks, sticks, twigs, and leave litter.

Sphinx Moth (Snake Caterpillar)



Description: For Adult

I. Size: 32-51mm in length.
II. Robust body.
III. Body and wings covered in scales
IV. Wings borders are dark brown/black.
V. Long slender antennae.
VI. Small eyes

Distribution:

I. Found in the forests of Costa Rica and Ecuador

Lepidoptera: Sphingidae

Hemeroplanes triptolemus

General Information:

I. In it's larval stage, this Sphinx Moth caterpillar can make itself look like small snake when it feels threatened by puffing up the area around its head. It has two spots on the ventral side of its head that resemble snake eyes when they are expanded. It will even mimic snake behavior by striking at predators.

Type of Mimicry: Cryptic Coloration/Camouflage

I. As a caterpillar, *Hemeroplanes triptolemus* feeds on *Mesechites trifida* larvae. The caterpillar is capable of expanding body segments to give it the appearance of a snake and even has black eye patches that intensifies the resemblance.
II. The snake mimicry is evident in it's behavior as well, as it will harmlessly strike at potential predators.

Common Lytrosis Moth

Distribution:

I. Worldwide

General Information:

I. Peppered moth caterpillars vary in length depending on species and geographic location. They are often brown, green or mottled in color. The body can appear smooth or textured.

II. They have a cleft head that resembles a twig that has been broken. When still and outstretched, peppered-moth caterpillars are easily mistaken for small twig.

Lepidoptera: Geometridae

Lytrosis unitaria

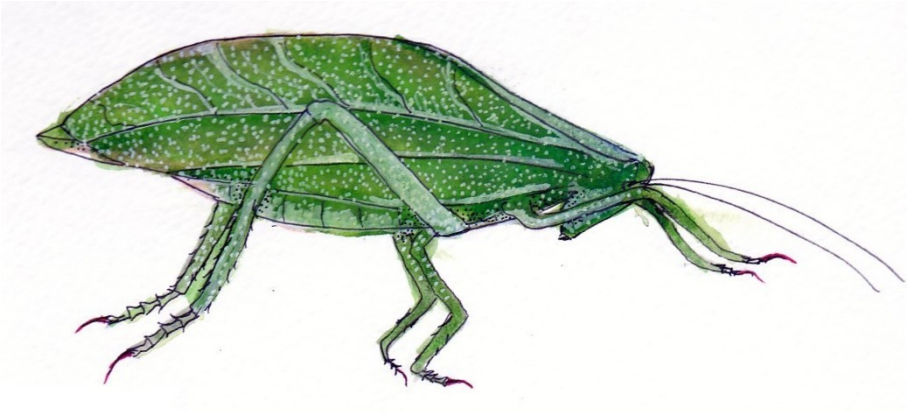
Type of Mimicry: Cryptic Coloration/Camouflage

I. Peppered moth caterpillars avoid predation by blending in with their environment, specifically they look significantly like a twig or branch.
II. Peppered moth adults have a mottled coloration that looks very much like the bark of a tree. When positioned on a tree trunk, it is very difficult to find them.

Katydid

Description: Adult Katydid

I. Size: 5-130mm in length.
II. Green, brown or mottled.
III. Antennae are as long as the body or longer.



Distribution:

I. Found worldwide, except Antarctica

Orthoptera: Tettigoniidae

Microcentrum spp.

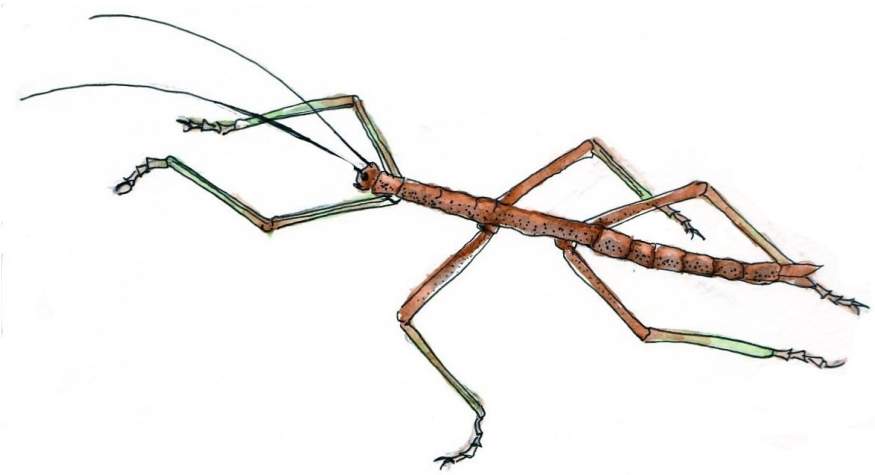
General Information:

I. Katydids are nocturnal, so they are most active at night. They get their name from the sound they make which sounds like someone saying Kay-tee-did.
II. Most katydids resemble some type of leaf and so they blend extremely well into their environment and can be very difficult to spot.

Type of Mimicry: Cryptic Coloration/Camouflage

I. Their wings have venation patterns that look similar to those of leaves.
II. Some species even have spots on theirs wings that look like they have been eaten by herbivorous insect or spot that look like moss or lichen growing. While some specie look like dead or dying leaves.

Stick Insect

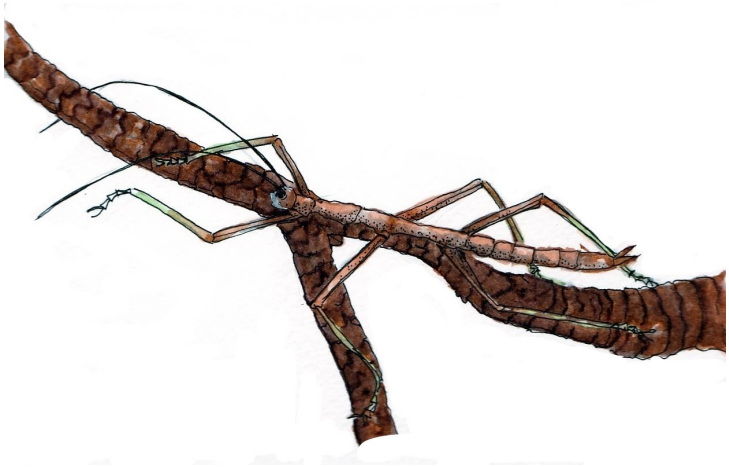


Description: Adult Stick Insect.

I. 1.5-30 cm in length.
II. Brownish, greenish or mottled color.

Distribution:

I. Found worldwide, except Antarctica



Phasmatodea: Phasmatidae

Phasmids

General Information:

I. Stick insects are typically long and slender but some species can be quite robust, and as the name suggests, they look very much like the sticks they can be found on.
II. They are often brown or green in color. They can be smooth or have a mottled or textured appearance that allows them to resemble the type of plant they are adapted to living on.

Type of Mimicry: Cryptic Coloration/Camouflage

I. They are often hard to spot due to how well they blend in with their environment as they strongly resemble twigs and sticks.
II. When disturbed they often rock back and forth. This behavior is thought to make them blend in even more by giving them the appearance of the stick blowing in the wind.

Thorn Bug

Description: Adult Thorn Bug

I. Size: 9-14 mm in length.
II. Bright green with yellow and/or red markings.
III. Long pronotal process.

Distribution:

I. Sub-Tropical United States.
II. Central and South America.

Hemiptera: Membracidae

Umbonia crassicornis

General Information:

I. Thorn bugs are mostly bright green in color and possess a long thorn-like pronotum.
II. Their color and shape resemble the thorns on a rose so blackberry bush. This resemblance protects the thorn bug from birds and other predators that easily confuse the thorn bug with actual plant thorns.

Type of Mimicry: Cryptic Coloration/Camouflage

I. Thorn bugs are protected from predators by mimicking the colors, structures and patterns that are found in their environment.

Orchid Mantis

Description: Adult Orchid Mantis

I. Size: Females reach up to 6cm in length. Males reach up to 3 cm in length.
II. Typically, white to yellow in color. Can be pink and purple as well.
III. Legs have flattened areas that resemble flower petals.

Distribution:

I. South East Asia

Dictyoptera: Hymenopididae

Hymenopus coronatus

General Information:

I. As a predator, orchid mantis uses cryptic mimicry to look like the flowers in their environment. New studies have shown that Flower Mantids do not hide among the flowers they resemble, instead they typically sit on a near by stick or leaf in plain sight. Insect pollinators were shown to approach the waiting mantis as often or more often than actual flowers.

Type of Mimicry: Cryptic Coloration/Camouflage

I. Flower mantids blend in with their surroundings. This protects them from predators, and also disguises them from passing prey.

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