University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Distance Master of Science in Entomology Projects

Entomology, Department of

2019

CLASH OF THE CHITIN

Patrick S. Natale III

Follow this and additional works at: https://digitalcommons.unl.edu/entodistmasters

Part of the Entomology Commons

This Thesis is brought to you for free and open access by the Entomology, Department of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Distance Master of Science in Entomology Projects by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

CLASH OF THE CHITIN

143

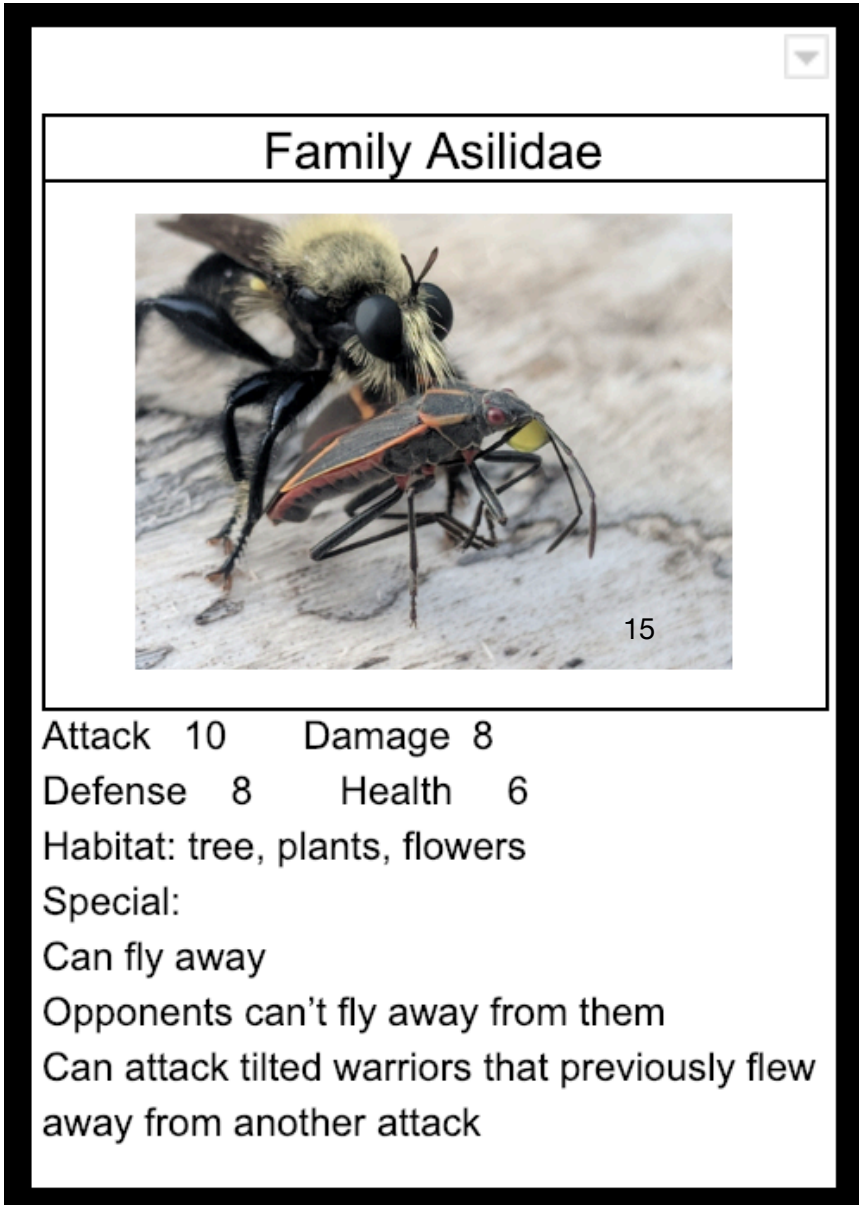
142

144

By Patrick S. Natale III

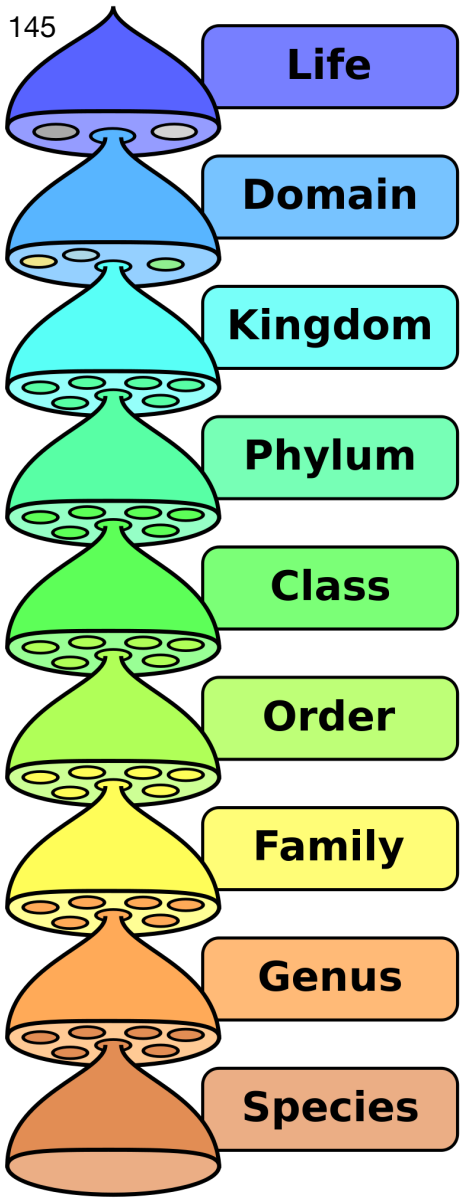
CLASH OF THE CHITIN

This is an exciting card game that will take you on marvelous adventures in forests and fields to collect warriors. These warriors are not imaginary. They are very real and they live everywhere. They are insects and their close relatives. How will you “collect” your warriors? Look no further than your pocket! You will use the camera on your cell phone, a careful eye, and skillful techniques to capture photos of these arthropods. You will then use an identification key to determine what you have captured. Slowly you will build your army, create your deck, and battle your fellow collectors. **Good luck!**



Your Army of Chitinous Soldiers

Before you are ready to collect you will need to understand a little about the history and attributes of your warriors. They have an incredibly old lineage. In fact, all of our warriors are arthropods which evolved on planet Earth over 500 million years ago. To put that in perspective, mammals like us did not evolve until approximately 160 million years ago (University of California Museum of Paleontology 2019). As we discuss our different types of warriors, we will be using biological terminology from the system of **taxonomy**. All living things are group into at least 8 categories that are arranged in order from the most inclusive (Domain) to the least inclusive (Species).



So What is an Arthropod?

An arthropod is an animal in the phylum Arthropoda. As you can see, arthropods come in many shapes and sizes but they do all have some attributes in common:

- Hard **exoskeleton** made of **chitin**
- Shed and regenerate their exoskeleton to grow
- **Bilateral symmetry**
- Segmented body
- Jointed appendages

So many to collect

There are many different types of arthropods but we are going to focus our “collecting” on 4 classes:

- Class Insecta
- Class Arachnida
- Class Chilopoda
- Class Diplopoda

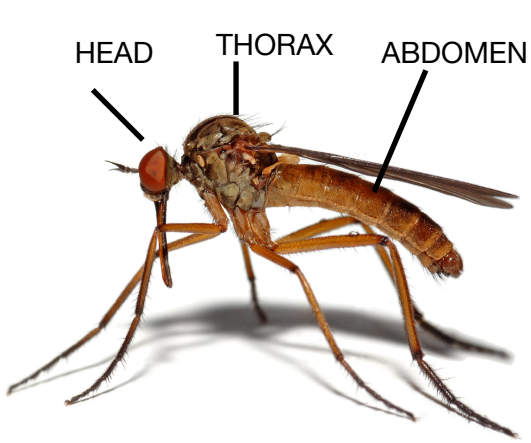
Class Insecta

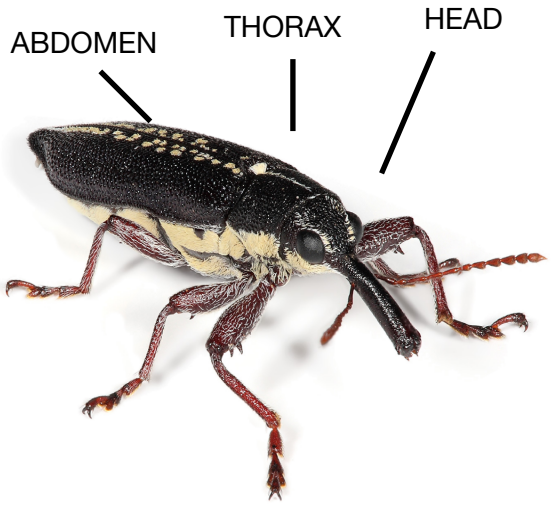
Most of your collecting will come from this class. They are commonly just called “insects” and insects are the most diverse animals on the planet (Triplehorn Et. al 2004). Currently, we have discovered and named about 900,000 insect species (Smithsonian 2019). That’s 80% of all the world's species and scientists think there are still millions more yet to be discovered!

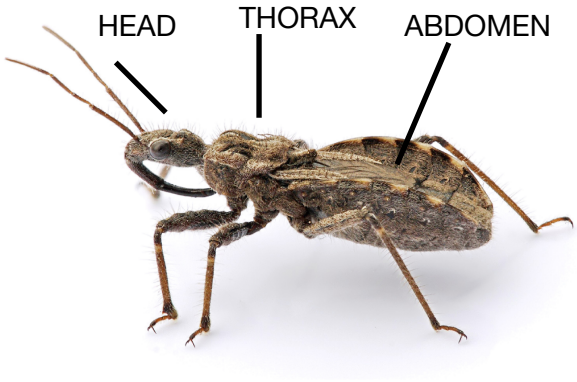
Most types of insects you will see today evolved on this planet around 200 million year ago (Wikipedia 2019). So what makes insects different from other arthropods?

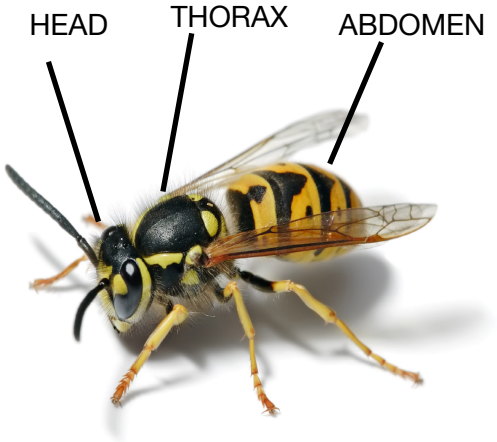
Class Insecta

- Three distinct body sections: head, thorax, and abdomen
- Six legs arranged in pairs connected to the thorax
- Three pairs of mouthparts
- Often have one pair or two pairs of wings (no other arthropods have wings)
- One pair of antennae









Class Insecta

As you can see, insects come in many forms but they do all have some attributes in common. In fact, they have more in common with each other than other arthropods because they share not just the same phylum but also the same class. Insects can be found almost anywhere, occupying many different **niches** and will most likely make up the majority of the warriors in your deck. As you are identifying your insects, you will often be able to figure out their **order** and sometimes even their **family**.

Class Arachnida

Members of this class of arthropods are very common and most often associated with spiders. However, there are other types of arachnids including organisms such as scorpions, ticks and mites. So what makes arachnids different from other arthropods?

Class Arachnida

- Two body sections: cephalothorax and abdomen
- No antennae
- Eight legs attached the the cephalothorax
- Two specialized appendages near their mouth called chelicera and pedipalp

Order Araneae (spiders)

Order Scorpiones (scorpions)

For our warriors we will focus on just two types of arachnids:

- order Araneae (spiders) and
- order Scorpiones (scorpions)

Class Chilopoda

Members of this class of arthropods are fast and furious hunters. They are commonly known as centipedes which means “one hundred feet” but as you will soon see, they do not actually have nearly that many. All Chilopoda share some common attributes:

- A head followed by a long trunk built of similar segments
- A single pair of walking legs on each body segment
- One pair of antennae
- Specialized legs near the head to deliver venom to prey
- Flattened appearance

7

This is the typical appearance of most centipedes you will “capture” with your camera. They do have some variations but they are nowhere near as diverse as insects or arachnids.

5

Class Diplopoda

Members of this class are slow moving **detritivores.** They are commonly know as millipedes which means “one thousand legs” but just like the centipede they really do not actually have that many legs. Diplopods share the following attributes:

- A head followed by a long trunk built of similar segments
- Typically more convex or **vermiculate**
- One pair of antennae
- Two pairs of walking legs on each segment

This is the typical appearance of most millipedes you will “capture” with your camera. There do have some variations but they are nowhere near as diverse as insects or arachnids.

Capturing with Photography

Now that you understand the history of your warriors it is time to go out and recruit your army with your camera.

Insects are everywhere and using a cell phone camera is super easy but this chapter will provide with some useful tips.

Safety First!!!

Be safe while wandering through fields and forests trying to capture amazing photographs of these wondrous animals.

- Never go alone
- Always let the adult in charge know where you are going
- Always know how to get back to where you started
- Choose locations you are comfortable with
- Dress appropriately
- Use caution when taking photos as arthropods may bite or sting if they feel threatened

Always allow common sense to prevail. If it feels unsafe, don't do it!

Equipment

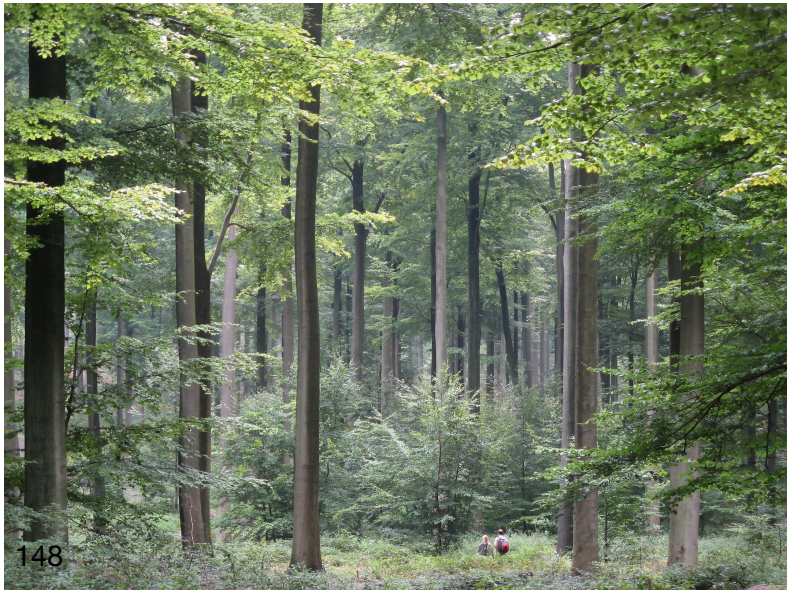
All you really need is a camera and the camera on your cell phone is more than enough. Having a cell phone will guarantee that you can always be in touch with the adults in charge. The cell phone camera will often have features like adding a GPS location to your photos so you can know exactly where you photographed your warrior. One very helpful addition to a cell phone camera is a clip on macro lens. These are relatively inexpensive and will allow you to capture better picture of insects without disturbing them. You can experiment with the best settings for taking insect pictures at home before you go out collecting. It will save you time and missed opportunities.

Where and When to Look

Insects and other arthropods are quite literally everywhere. The biggest limiting factor for collecting will be the time of year and this will depend on where you live. If you live in an area where all four seasons are represented, you can find insects and their relatives moving when the weather becomes warm enough to wear a t-shirt but the best season is summer. Arthropods are **poikilotherm** so they rely on their environment to warm them up.
Now let's talk about some specific habitats.

Forest

The forest is an obvious choice. Almost any of the arthropods discussed in the next chapter can be found in wooded areas. Insects occupy many **niches** so make sure you look for them everywhere. Search under logs, in the canopy, near little streams, on little plants, on mushrooms, and everywhere in between. Logs will be a very notable resource where you can find colonies of termites, ants, beetles, centipedes, millipedes, spiders and much more. Always exercise caution. Wearing gloves is an excellent idea - be sure to use gloves that will not interfere with camera use.



Fields

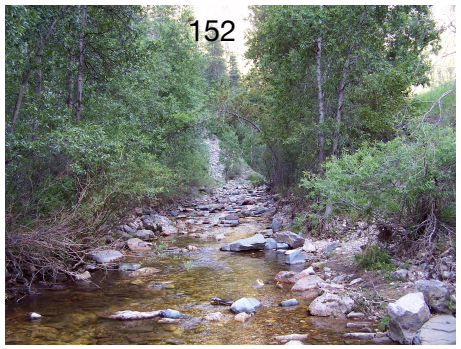
Open fields are usually full of flowers during the right time of year. Flowers attract both **pollinators** and the arthropods that hunt them. Bees and butterflies will be all over but there will also be many other types of insects. Pay careful attention because many **predators** feed on **true bugs** and spiders will be well camouflaged.

Desert

If you live near an arid region then you will have access to some very unique arthropods. As mentioned earlier, always exercise caution when taking photos but the nature of some desert arthropods makes this even more essential. That being said you may find scorpions, tarantulas and centipedes. The use of a macro or zoom lens will come in very handy here because it will allow you to stand at a safe distance and still get a great photo.

Ponds and Streams

Several types of insects will primarily be found only in or near the water. These include dragonflies, damselflies, diving beetles, water striders, and the legendary giant water bug. These types of insects will be discussed in more detail next chapter.



Backyards and parks

Do not overlook your backyards, gardens, and parks. These spaces will contain opportunities to capture photos of hundreds of different arthropods. Just look into your backyard and imagine all the places an insect might like to hang out. Then go out and look there. Anything can be a unique niche when you are small and have an **exoskeleton**.

153

154

Indoors

What if you want to take some photographs but you are grounded or the weather is not right? No problem! Insects and their arthropod relatives live right in our homes. Check potted plants, kitchen cabinets, and dark corners. If you have a basement or attic that you can safely explore, be sure to check there as well. They could be anywhere but moisture, darkness, food, and a place to hide are the most enticing places.

155

How to Take the Best Picture for Identification

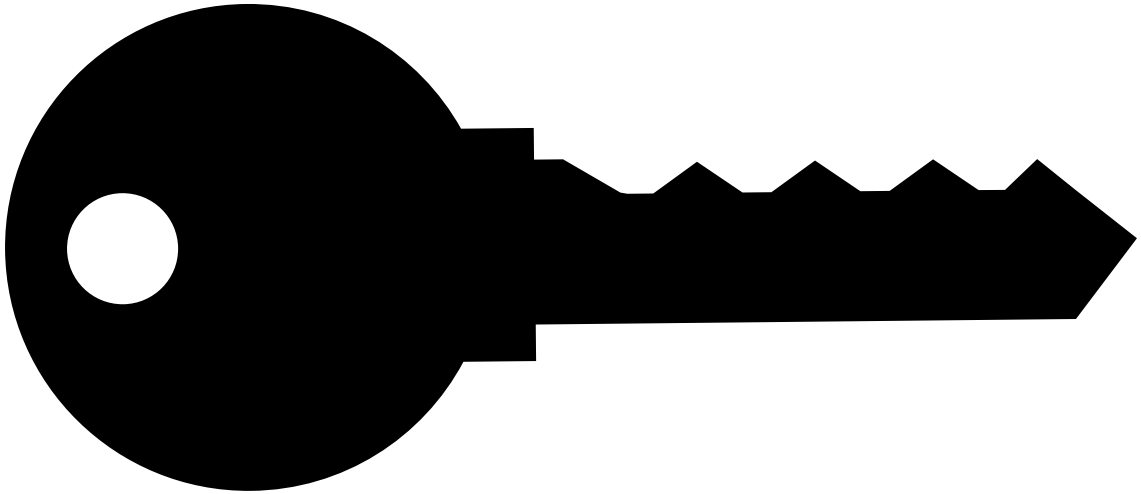
The goal of your photography should be to capture as many characteristics as possible to help with identification, so be sure to take multiple photos of your subject from a few different angles. Do your best to take photos from directly overhead, left side, right side, front, and back.Try to capture pictures of their wings, legs, mouthparts, and antennae. These attributes will help with identification. Also take note of where you found your arthropod. Was is on a flower, under a log, or in a garbage can? This type of information can also help with identification so you can use your warrior in battles.

Now grab your camera and collect some warriors!

Making an Identification

Now that you have your photos it is time to identify the arthropods you have captured with your camera. Answering questions about the arthropods in your photos and comparing them to known images will help you determine the classification of your warrior with some degree of certainty.
This basic identification key is an excellent starting place for you to learn to identify arthropods. As you become more proficient in identification you may choose to expand this key or use other methods.

IDENTIFICATION KEY



Starting at the beginning, answer questions about your arthropod and continue to follow the prompts until you have identified your warrior

How many legs?

6

Go to Insecta

8

Go to Arachnida

More than 8

Go to Myriapoda

Class
ARACHNIDA

Which arachnid does your photo look the most like?

4

You captured the order Araneae

3

You captured the order Scorpiones

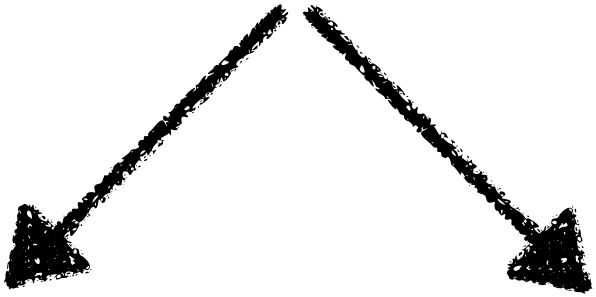
Subphylum
Myriapoda

Which Myriapoda does your photo look the most like?

7

You captured the class Chilopoda

5



6

You captured the class Diplopoda

8

Class
INSECTA

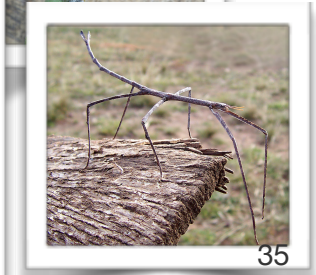
Does your insect have wings?

no

124

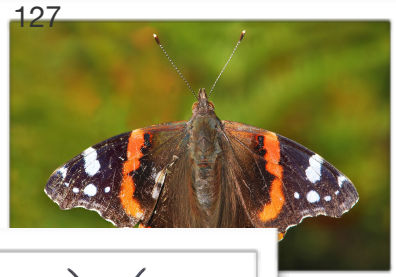
69

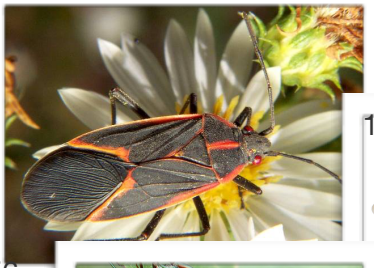
39


35

Go to no wings

yes


127


56

116

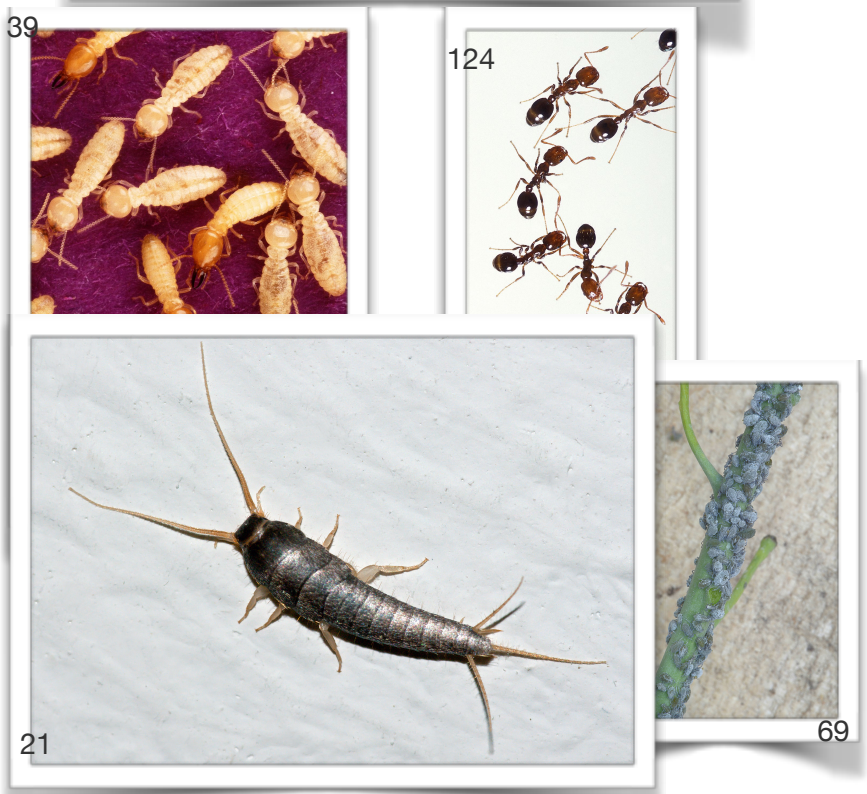
105

25

Go to wings

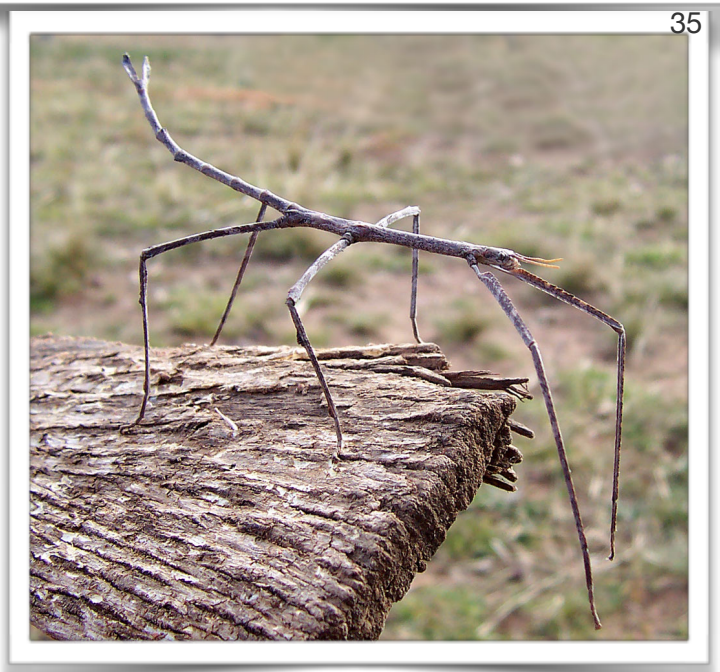
No wings

Normal legs



Go to normal legs

Long legs and looks like a stick

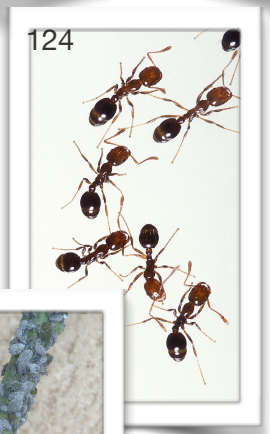


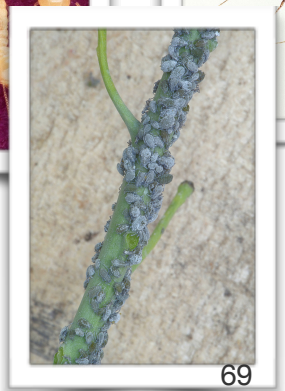
You captured the order Phasmatodea

Normal legs

No **cerci**

39


124


69

Go to no **cerci**

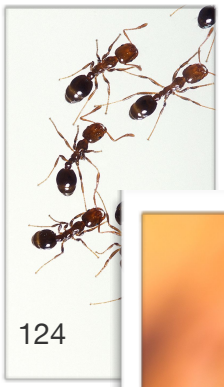
3 **cerci**

21

You captured the order Thysanura

No **cerci**

Dark color with pinchers, **mandibles,** and **geniculate antennae**



124

125

You captured the family Formicidae

Found cluster feeding on a plant

68

69

You captured the family Aphididae

Light color found in wood

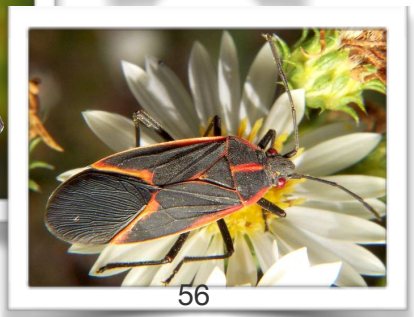
39

You captured the order Isoptera

Wings

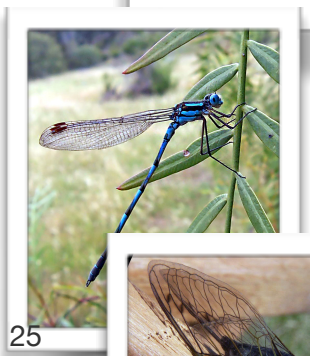
Does your insect have **membranous** wings with veins?

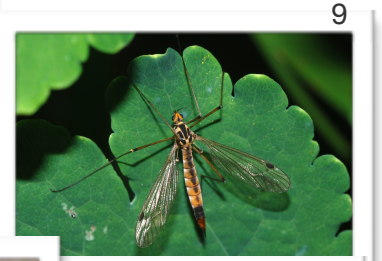
no



Go to not membranous

yes

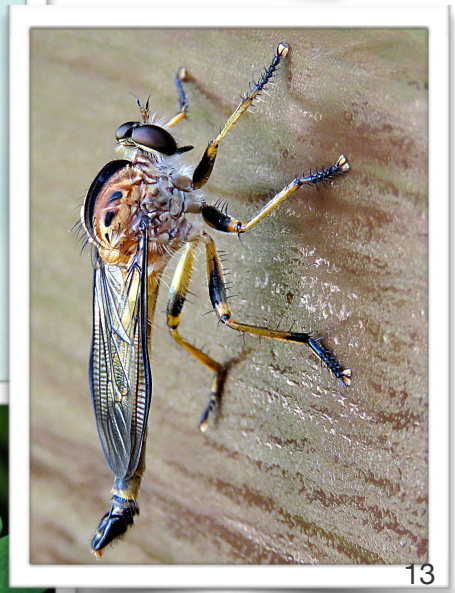




Go to membranous

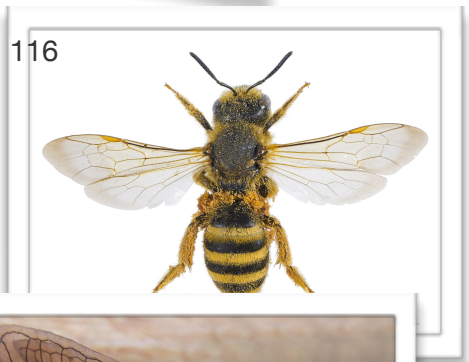
Membranous

2 wings



Go to order Diptera

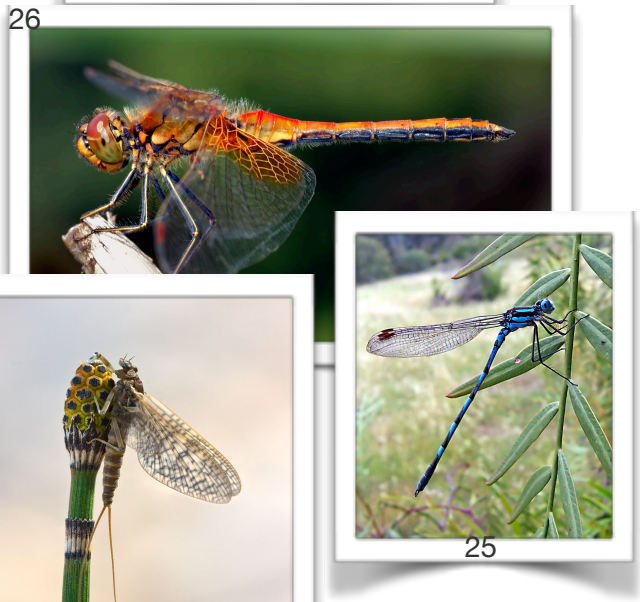
4 wings

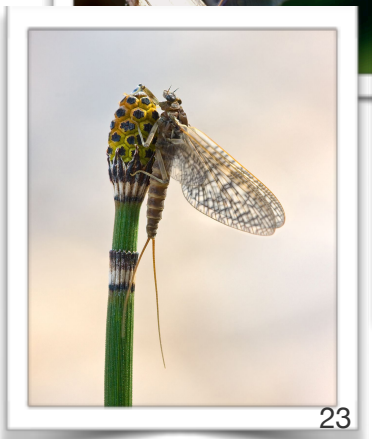


Go to 4 wings

4 wings

4 wings held away from body



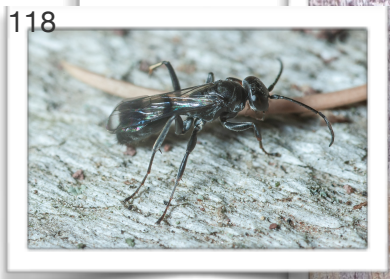


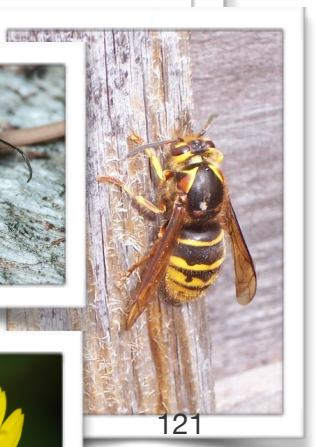
Go to 4 wings held away from body

4 wings held tent-like over back

You captured the family Cicadidae

4 wings flat over body or slightly off to the sides

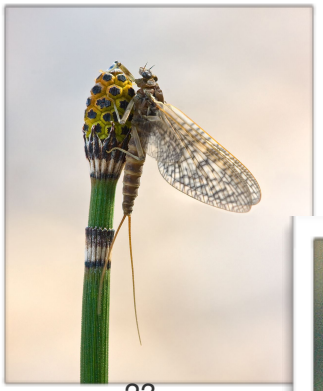




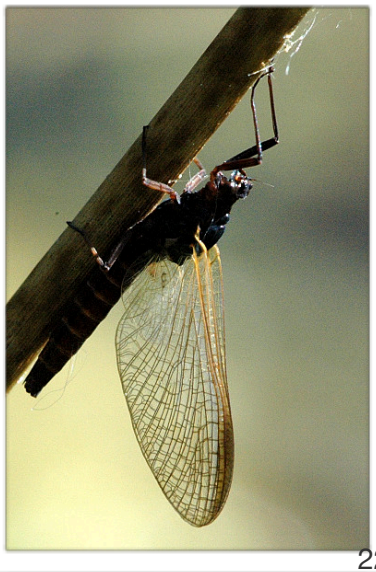
Go to Order Hymenoptera

4 wings held away from body

Hind wing much smaller than forewing



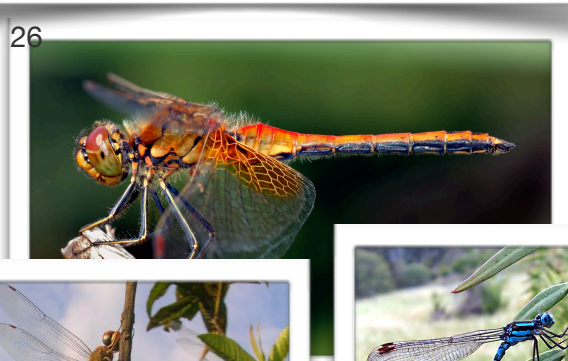
23



22

You captured the order Ephemeroptera

4 wings held away from body



26

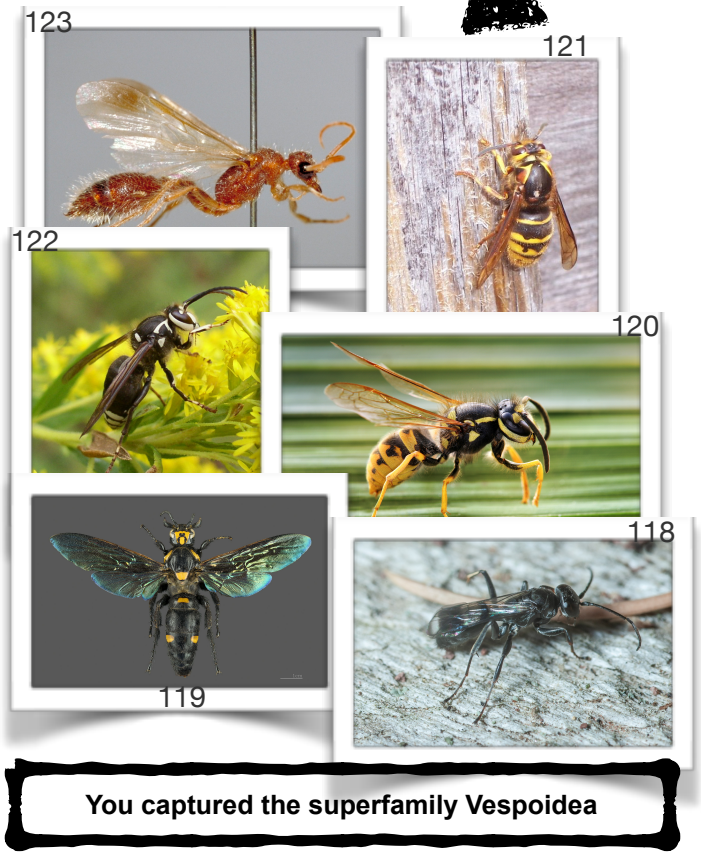
27

25

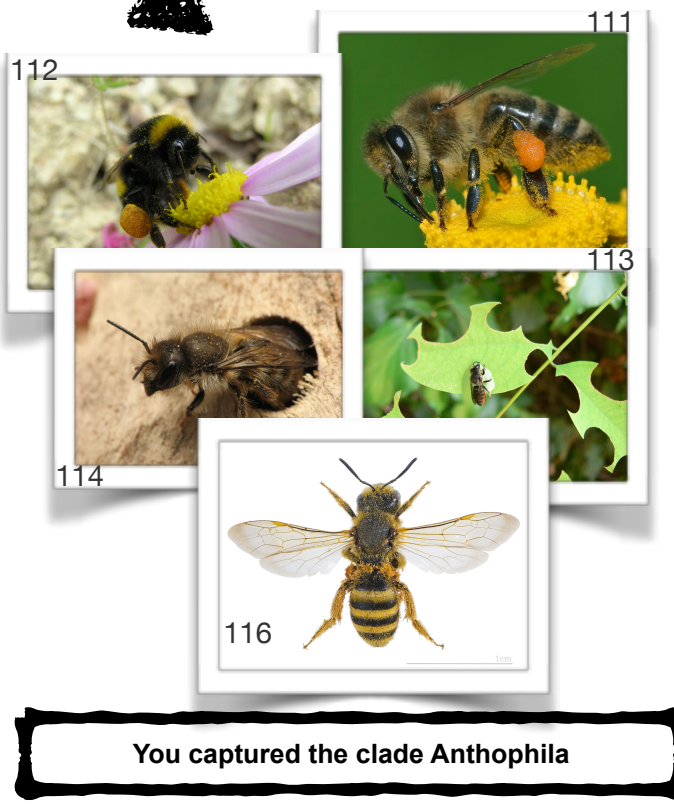
You captured the order Odonata

Order Hymenoptera

Which Hymenopteran does your photo look the most like?



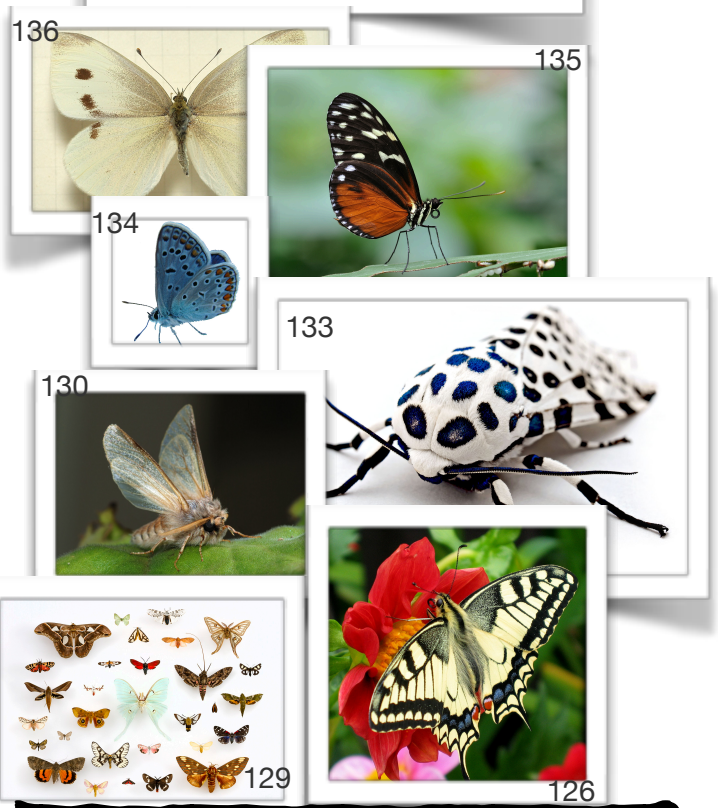
You captured the superfamily Vespoidea



You captured the clade Anthophila

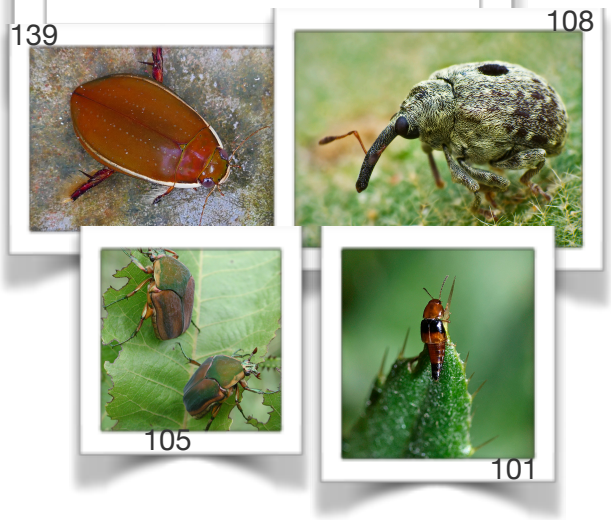
Not membranous

Powdery wings



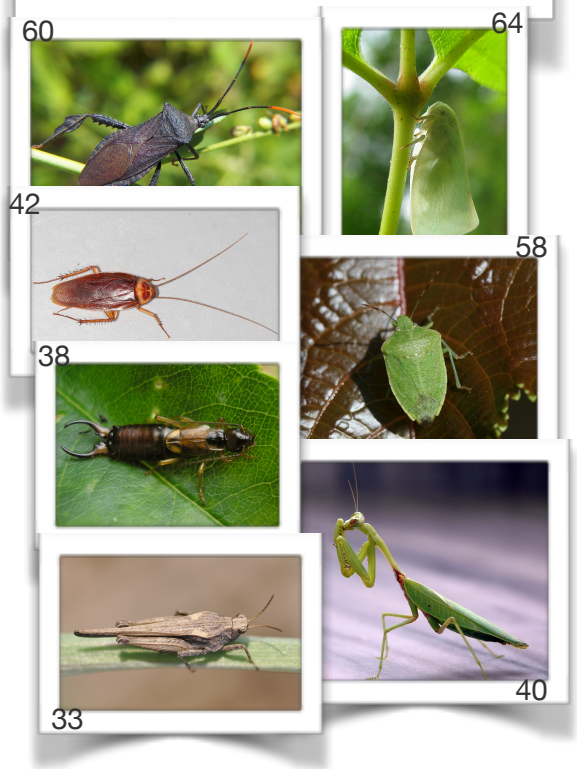
You captured the order Lepidoptera

Hardened wings that meet in middle and form a straight line down the middle of back



Go to order Coleoptera

Leathery wings



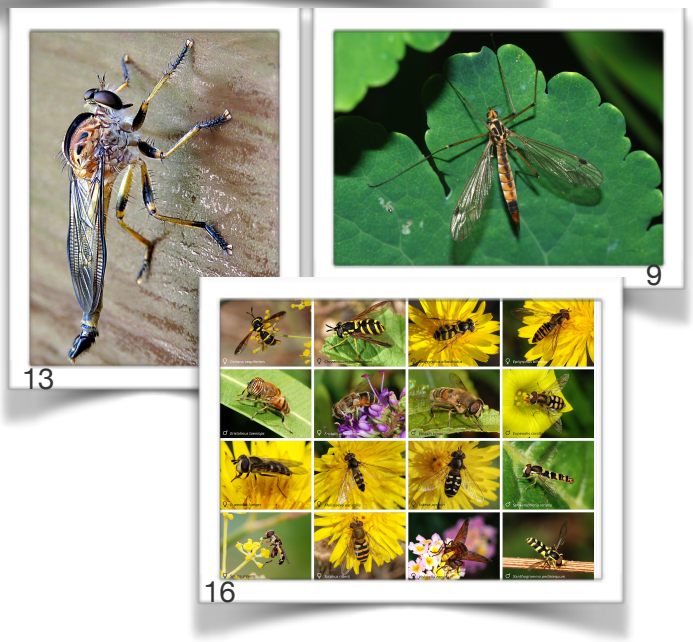
Go to leathery wings

Order Diptera

Looks like a fly

Go to looks like a fly

Doesn’t look like a fly

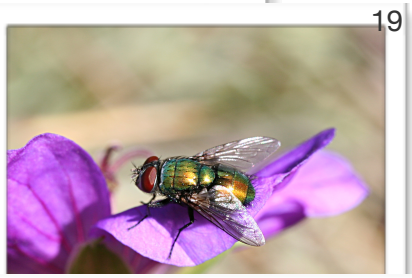


Go to doesn’t looks like a fly

Looks like a fly

Eyes like this

20


19

18

17

You captured the family Muscidae, Sarcophagidae or Calliphoridae

Or eyes like this

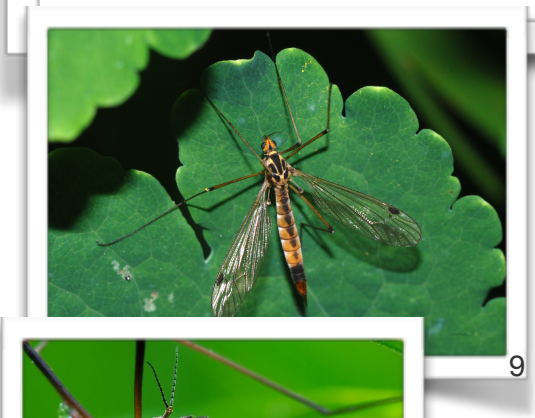
11

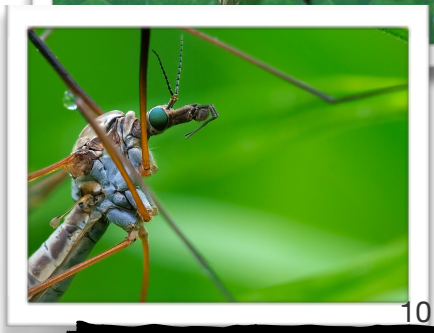
12

You captured the family Tabanidae

Doesn't looks like a fly

Long delicate legs, slender body, wings held like a "V"


9


10

You captured the family Tipulidae

Looks like a bee with 2 wings and big eyes

16

You captured the family Syrphidae

Narrow abdomen with wings folded over back

14

13

You captured the family Asilidae

Order Coleoptera

Found in water

Go to Coleoptera found in water

Wings look shell-like

Go to wings look shell like

Wings appear flimsy and often do not cover entire abdomen

Go to wings appear flimsy

Order Coleoptera found in water

Which aquatic Coleopteran does your photo look the most like?

139

You captured the family Dytiscidae

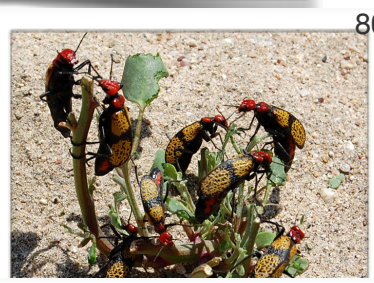
138

You captured the family Gyrinidae

Wings appear flimsy

“Neck-like” thorax
WITH distinct head

79


80

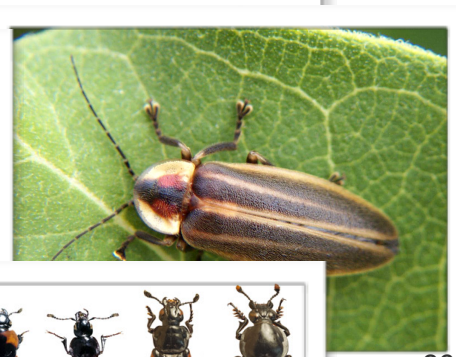
81

82

You captured the family Meloidae

“Neck-like” thorax
WITHOUT distinct head

99


86

83

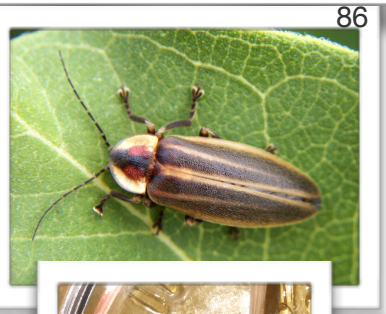
Go to without distinct head with “neck-like” thorax

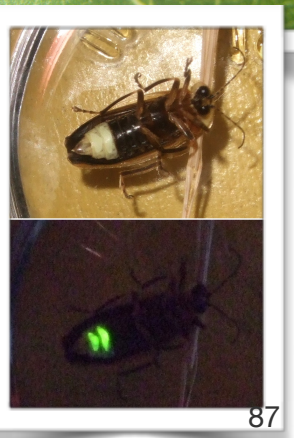
“Neck-like” thorax WITHOUT distinct head

Clavate antennae **thorax** with robust round abdomen

You captured the family Silphidae

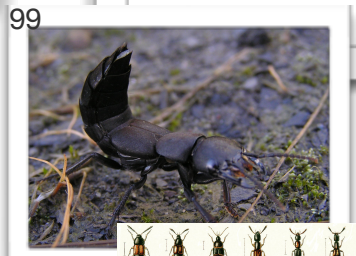
Bioluminescent abdomen

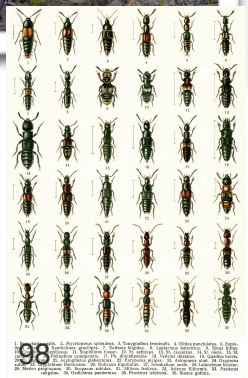




You captured the family Lampyridae

Rectangular shaped **elytra** only covering the **thorax** with narrow abdomen





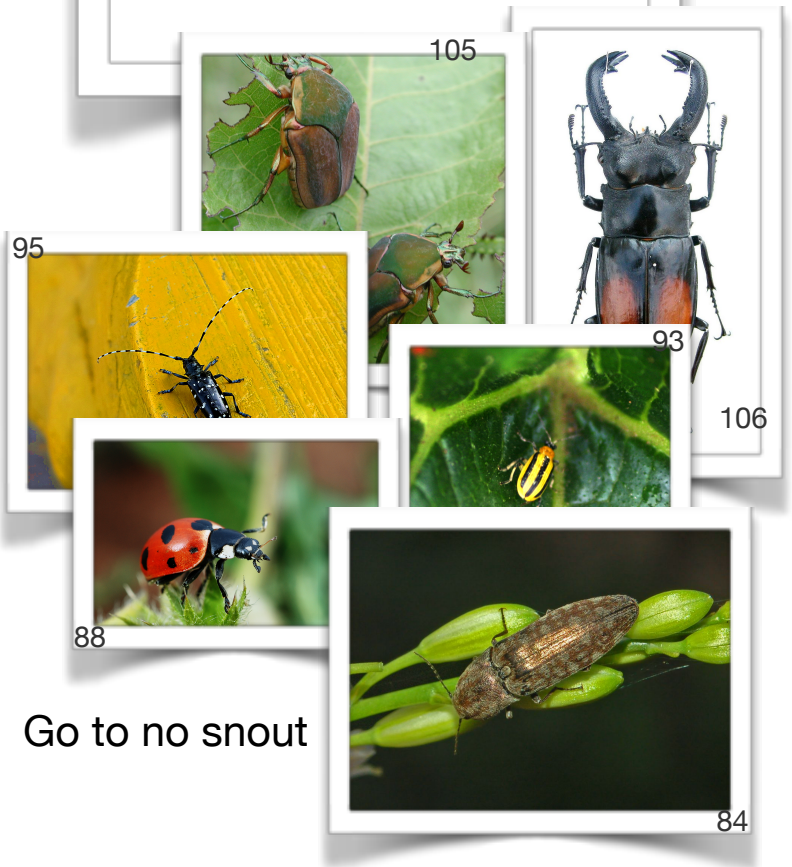
You captured the family Staphylinidae

Wings look shell-like

Snout-like mouthparts

You captured the family Curculionidae

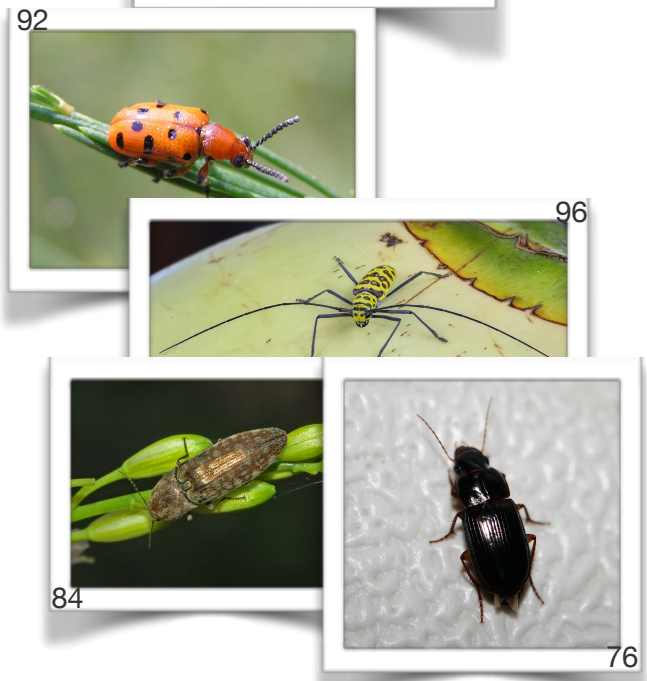
No snout



Go to no snout

No snout

Oblong

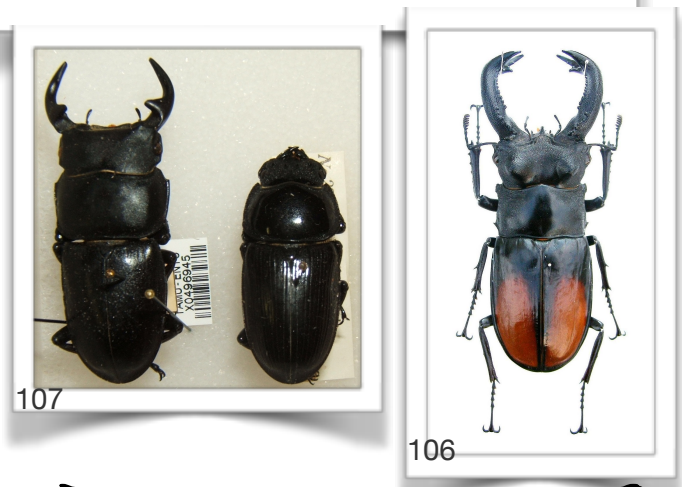


Go to oblong

Roundish

Go to roundish

Large forward facing mandibles



You captured the family Lucanidae

Roundish

Clavate antennae

88

89

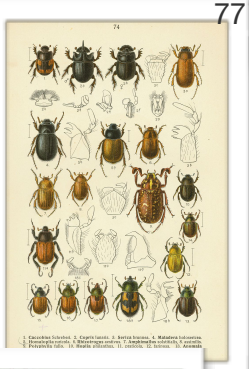
90

You captured the family Coccinellidae

Lamellate antennae

103

77



104

105

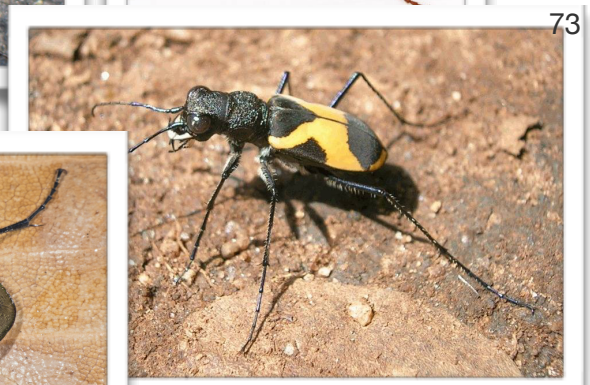
You captured the family Scarabaeidae

Oblong

WITH **cursorial** legs

71

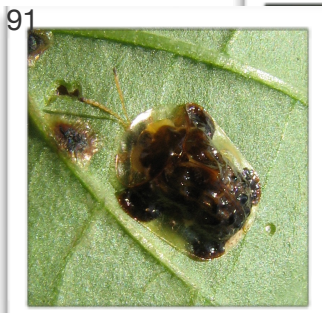
72


73

75

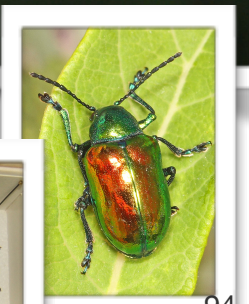
You captured the family Carabidae

WITHOUT **Cursorial** legs


91

84

78


94

Go to WITHOUT **Cursorial** legs

WITHOUT **cursorial** legs

Shiny black oblong beetles with small horn on head and elbowed antennae with three teeth at end

78

You captured the family Passalidae

Bullet like body with **serrate** antennae

84

85

You captured the family Elateridae

Filiform or **serrate** antennae without cursorial legs often colorful

92

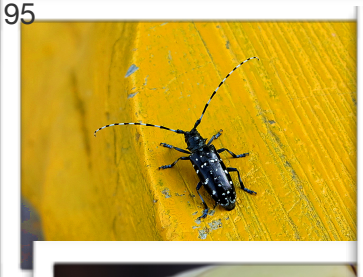
95

Go to **filiform** or **serrate** antennae WITHOUT cursorial legs and often colorful

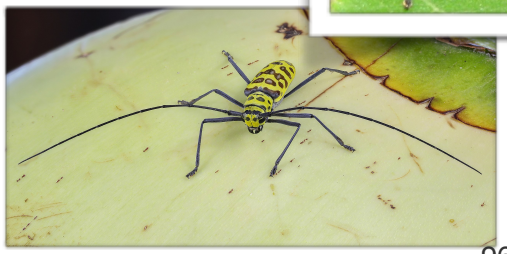
Filiform or **serrate** antennae WITHOUT cursorial legs, often colorful

Very long **filiform** or **serrate** antennae arising from frontal **tubercles**

95



97



96

You captured the family Cerambycidae

Average **filiform** or **serrate** antennae NOT arising from **tubercles**

91

92

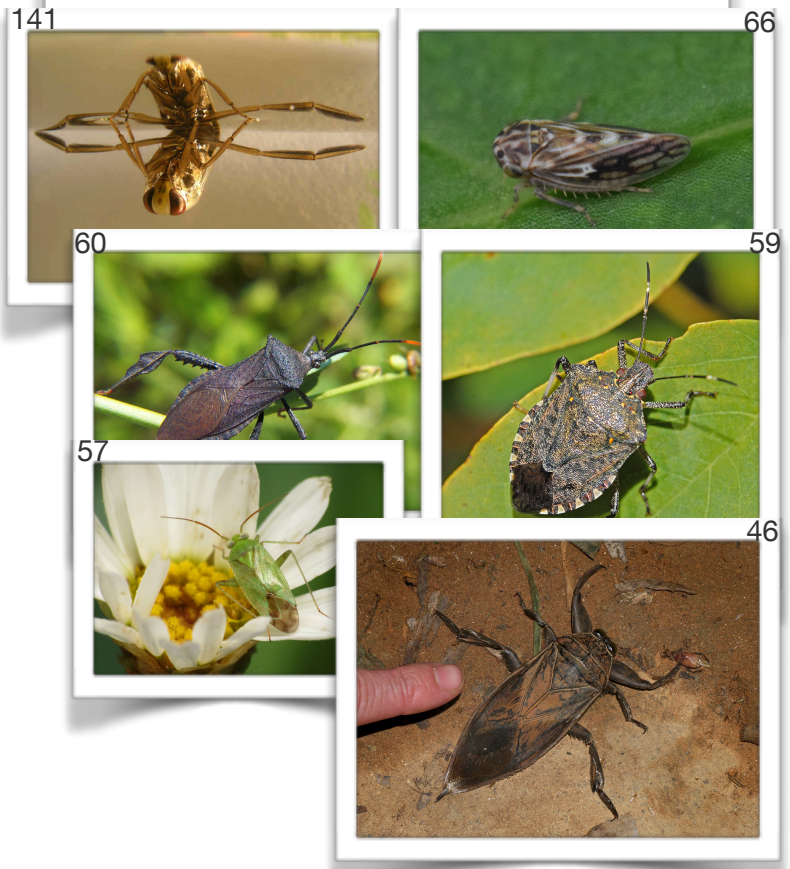
93

94

You captured the family Chrysomelidae

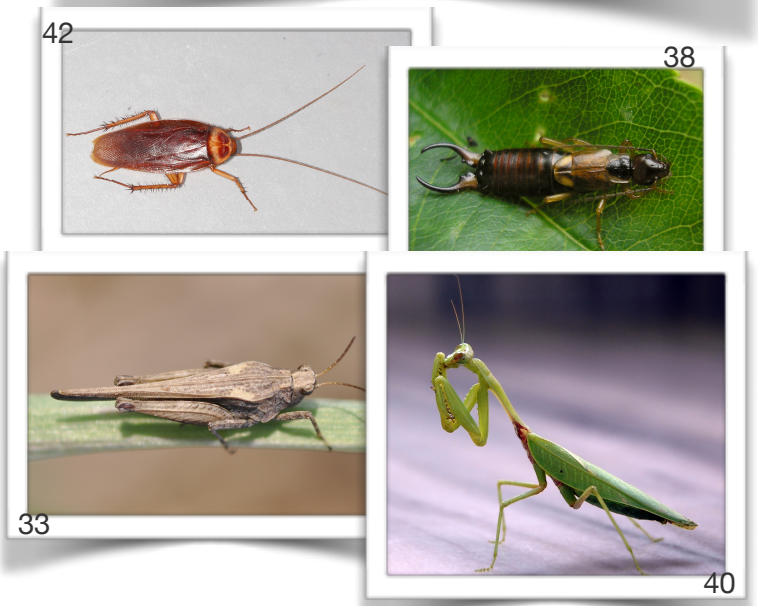
Leathery wings

Wings form an “X" and/or triangle on back



Go to Order Hemiptera

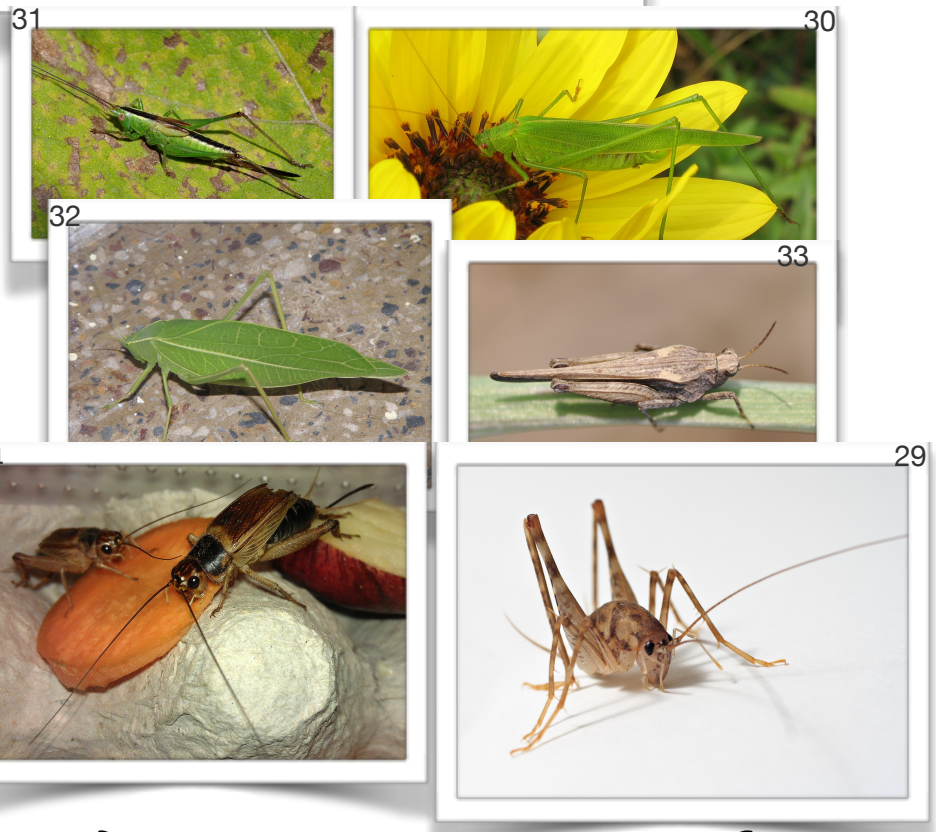
Wings DO NOT form an “X" and/or triangle on back



Go to Wings DO NOT form x and/or triangle on back

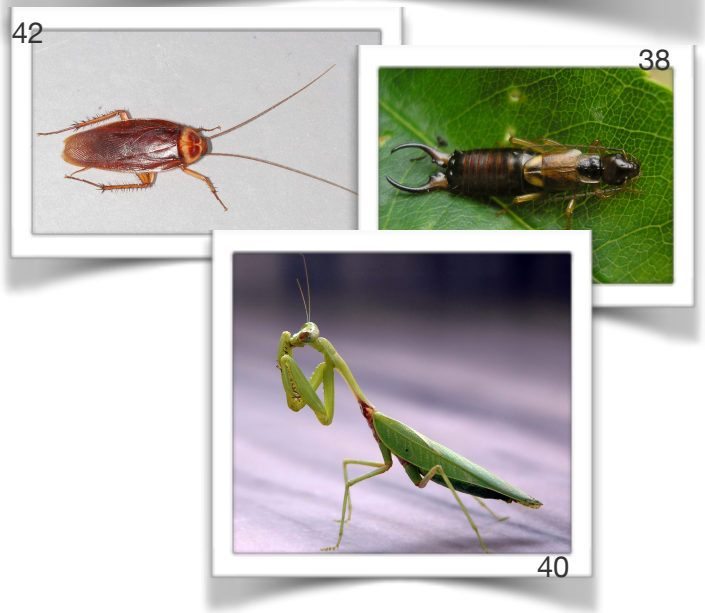
Wings DO NOT form an “X” and/or triangle on back

Have long rear **saltatorial** legs



You captured the order Orthoptera

WITHOUT long rear **saltatorial** legs



Go to WITHOUT long rear **saltatorial** legs

WITHOUT long rear **saltatorial** legs

Have long rear **cursorial** legs and flat body

42

44

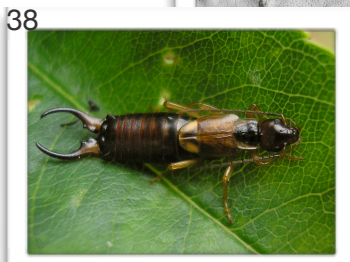
43

You captured the order Blattodea

Short wings with large pincher **cerci**

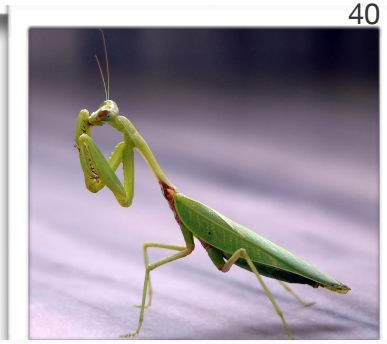
36

37


38

You captured the order Dermaptera

Have long **prothorax** with distinct **raptorial** front legs


40

41

You captured the order Mantodea

Order Hemiptera

Found in water

Go to Hemipteran found in water

NOT found in water

Go to Hemipteran NOT found in water

Hemipteran found in water

Skate on water surface

47

You captured the family Gerridae

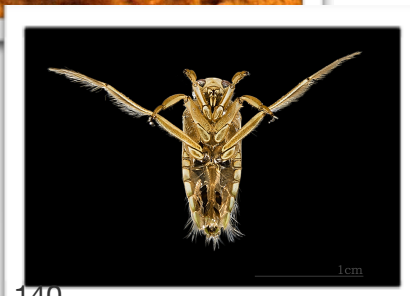
Large WITH **raptorial** front legs

46

You captured the family Belostomatidae

Swims underwater WITHOUT **raptorial** front legs

45



140

Go to Hemipteran that swims underwater WITHOUT **raptorial** front legs underwater

Hemipteran that swims underwater WITHOUT **raptorial** front legs

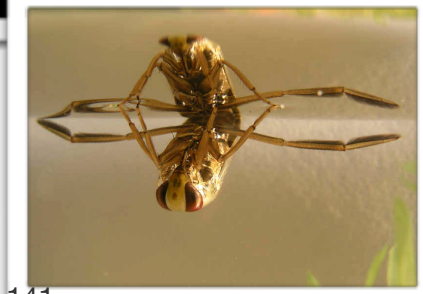
Swims right side up

45

You captured the family Corixidae

Swims upside down

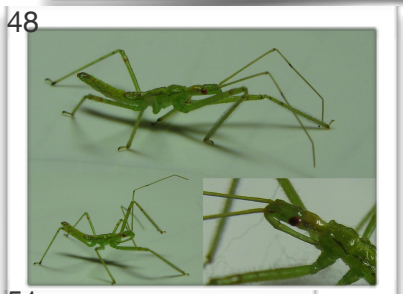
140

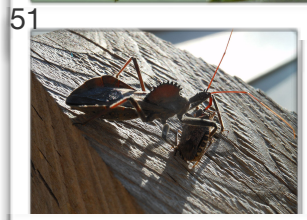

141

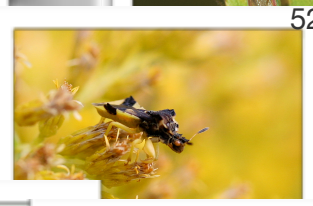
You captured the family Notonectidae

Hemipteran NOT found in water

Triangle on back with thick **rostrum** and robust for **raptorial** legs

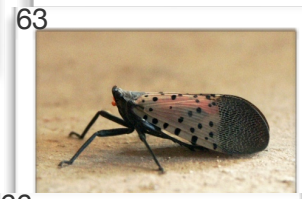


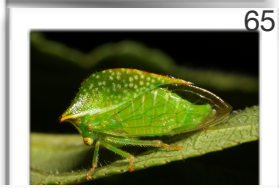




You captured the family Reduviidae or Nabidae

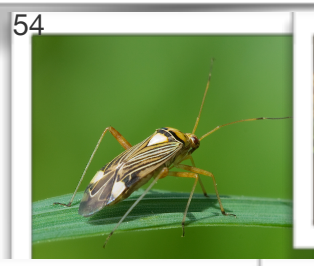
Small leaper with wings held tent like over body

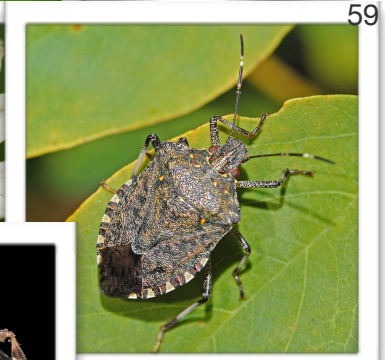




You captured the family Fulgoridae, Flatidae, Membracidae or Cicadellidae

Triangle on back with slender **rostrum** and slender front legs





You captured the family Miridae, Lygaeidae, Rhopalidae, Coreidae or Pentatomidae

How to Play Clash of the Chitin

NUMBER OF PLAYERS: 2-4

ITEMS NEEDED:
Your deck, one six sided die (or a die rolling app), and something to keep track of health and counters

MAKING A DECK:
Players will make decks using their photos of identified arthropods. Each warrior card must be a unique photo even if it is the same type of warrior (e.g. player can have two spiders but must be photos of two different spiders not repeats of the same one). The photos and attributes of each warrior can be added to the google doc template (https://docs.google.com/document/d/1zu4AJrR5Km0RWZf5igtpvxDo9UNMCAaXyUc7xGroLLE/edit?usp=sharing) and printed out on card stock for play. You will also need to print out the habitat cards you need. Habitat types are listed with the warrior attributes.

DECKS:
Size can vary from 10 to 100 cards. Deck size will be determined before play with all players having the same size deck. Typically, the larger the deck, the longer the game. Once deck size is determined, players must decide if they want to include aquatic insects. Once these decisions are made it is time for each player to put together their own deck for the game.

OBJECT OF GAME: To destroy all of your opponent's arthropod warriors. The last player with warriors wins.

Game sequence:

I. All players start by rolling one six sided die. Order of play proceeds from highest roll to lowest roll. Ties are re-rolled for dominance.

II. Once player turn order is established, each player draws five cards from their deck as their starting hand and keeps them hidden from their opponents.

III. Turn sequence

A. Attack phase

1. If player has warrior in play the player may attack another warrior that is in play (see combat section).

B. Draw phase

1. Player may discard any number of cards into their salvage pile
2. Player draws enough cards from their deck to replace played and discarded cards to bring their hand back to five. If the player has no more cards they will reshuffle their salvage pile and use them. Defeated warriors and destroyed habitats go into the "carbon cycle" pile and are out of play.

C. Assembly phase

1. Player may put one habitat card and one warrior into play as long as the required habitat is in play. Habitat does not need to be their own card.
2. Special abilities may be activated if warrior did not attack; tilt card to indicate creature is inactive for the rest of the round
3. If all of a habitat type is destroyed, all warriors on the board that rely on that habitat typer are also destroyed.

D. Turn ends and moves to next player

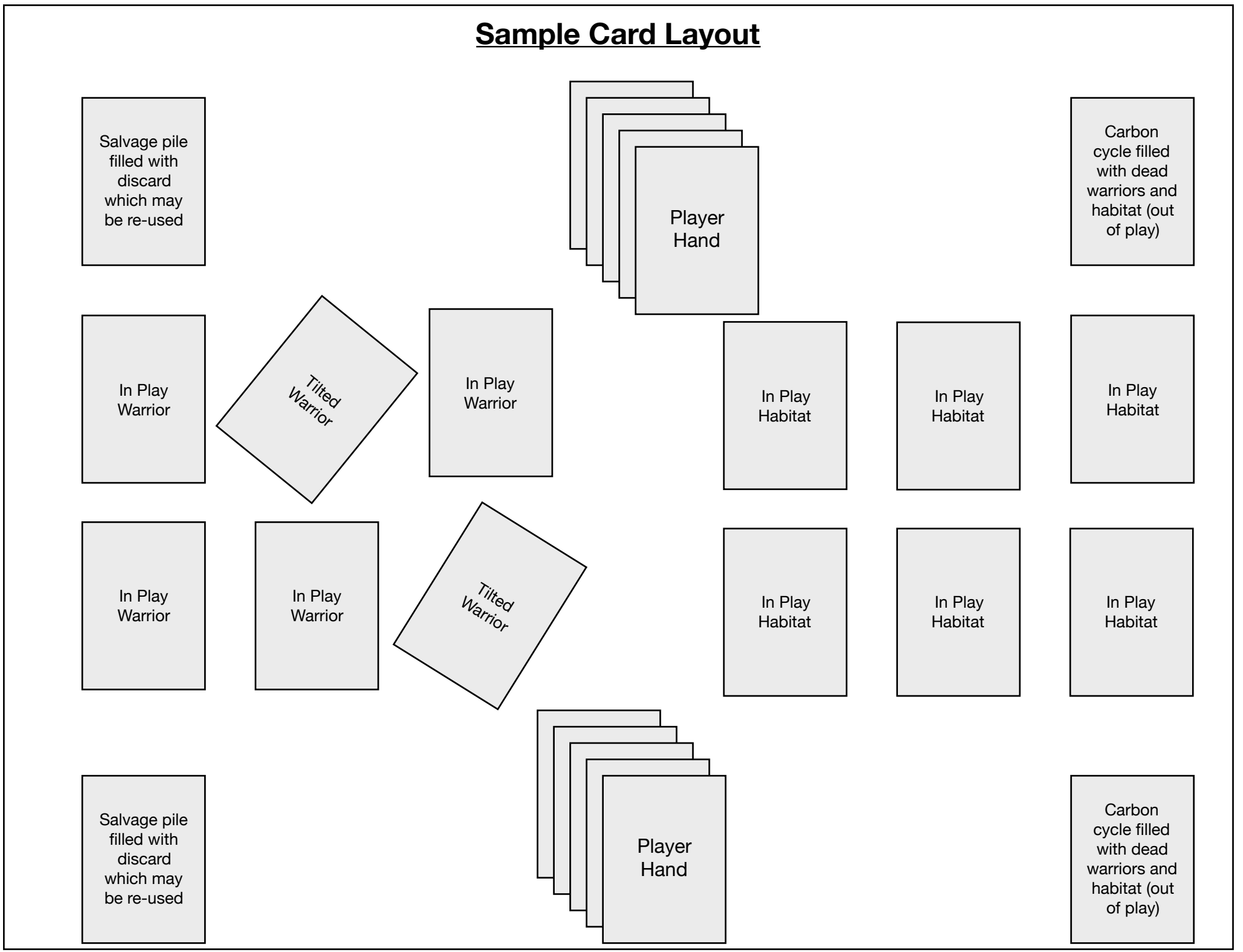
COMBAT

I. Player's warrior may attack any other warrior in play during player's attack phase.
   A. Player may declare one attack at a time so they can decide if they want to commence more attacks.
      1. One warrior attacks another warrior even if that warrior is tilted
      2. After attack, tilt card to indicate the attacking warrior is inactive for the rest of the round.
         a) Tilted warriors can still be attacked.
   B. If the warrior being attacked is not tilted, the defending player may choose to block or fly away
      1. If a warrior blocks or flies away they may not attack or use special for the remainder of that round; tilt card to indicate.
      2. If a warrior can fly away, it avoids all attacks for the rest of the round but becomes tilted. Some attackers can't be avoided this way.

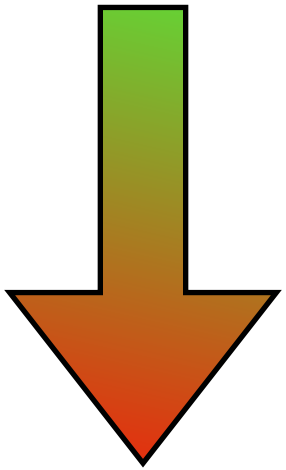
Sequence of combat

1. Attacking player declares first attack, including if special will be used in attack.
2. Defending player decides to block, fly away, or use special.
3. Attacker rolls die and adds resulting number to attack number.
4. If defender decides to block they roll die and add resulting number to defense number.
5. If attacker score is higher, then damage is subtracted from defending warriors health.
6. If damage brings health to zero or less, the warrior dies and is put in carbon cycle pile.
7. If defender does not die, note how much health is remaining.
8. The attacking player can initiate new attacks until all of their warriors are tilted.

Sample Card Layout



Got Questions?



Please send e-mail to creator:
Patrick Natale
clashofthechitin@gmail.com

Warrior Descriptions and Attributes

CLASS ARACHNIDA

Order Araneae

Spiders are crafty predators eating most other arthropods when they have the chance. Many can weave webs to catch their prey delivering a venomous bite with their **chelicerae.** They are found in just about every habitat except underwater.

Attack 5 Damage 8
Defense 2 Health 5
Habitat: Any besides water
Special:
Webs prevent fly away

Order Scorpiones

Scorpions are found in warmer climates in both deserts and forests. They are awesome predators using both their **chela** and **telson.** Their **telson** is armed with a powerful sting. They use their sting to subdue prey and defend themselves.

Attack 10 Damage 10
Defense 10 Health 10
Habitat: Desert or tropic
Special:
Causes 5 damage to attacker when blocking

SUB-PHYLUM MYRIAPODA

Class Chilopoda

Centipedes are voracious predators that move quickly and efficiently. Using their many legs and specialized venom injecting fore legs they make brutal adversaries. Since they are not insects, they do not have wings so they must always attack from the ground. They are typically found in dark and moist locations like under logs or in basements.

Attack 10 Damage 10
Defense 5 Health 10
Habitat: Logs or Dwellings
Special:

Class Diplopoda

Millipedes are slow moving detritivores eating anything they come upon that does not move. They are not good at attacking but their defense and health is strong. When attacked, they can roll into a tight spiral and emit toxins. They like dark and moist locations like under logs or in basements.

Attack 2 Damage 2
Defense 10 Health 20
Habitat: Logs or Dwellings
Special:
Roll 2 die when defending
2 damage to attacker when blocking

CLASS INSECTA

Order Thysanura

Silverfish are fast moving but weak fighters. They are found anywhere there is moisture and decaying matter.

Attack 1 Damage 1
Defense 8 Health 1
Habitat: Dwellings or logs
Special:

Order Ephemeroptera

Mayflies spend most of their lives as **naiads** living underwater. At certain times of year they emerge from the water as winged adults in vast numbers. As adults they reproduce and then die. Adult often do not eat and die after a few days. They are an important food source for many organisms including fish.

Attack 0 Damage 0
Defense 2 Health 1
Habitat: Water
Special:
Bringing one into play counts as 10 warriors. These warrior then die of one per turn at the beginning of the players attack round.

Order Odonata

Dragonflies and damselflies are incredible in flight. The aerial acrobatics they are able to perform are amazing. They spend a large majority of their lives as **naiads** living underwater. They emerge as winged adult aggressively grabbing prey in mid-flight.

Attack 10 Damage 5
Defense 10 Health 5
Habitat: Water
Special:
Can fly away
Opponents can't fly away from them
Can attack tilted warriors that previously flew away from another attack

CLASS INSECTA

Order Orthoptera

Crickets, grasshopper, and katydids are found almost everywhere and their diet ranges from plants to occasional predation. They are often difficult for predators to catch because they have **saltatorial** hind legs allowing them to jump far. They can also create loud noises to communicate with each other and startle predators. They do this through **stridulation**.

Attack 4 Damage 3
Defense 8 Health 8
Habitat: Any besides water
Special:
Sonic blast will stun any warrior for one full round
Jump allows avoiding one attack per round without being tilted

Order Phasmatodea

Stick and leaf insects are peaceful **phytophagous** insects that blend in perfectly with their surroundings. They slowly move through the plants they eat avoiding detection. They go as far as gently swaying when the wind blows to imitate plants.

Attack 2 Damage 1
Defense 2 Health 2
Habitat: plants, trees or flowers
Special:
Camouflage can be used once per turn to avoid one attack but does not cause warrior to tilt so they can still perform another action

Order Dermaptera

Earwigs eat plants and detritus. They can be found in forests. They are not particularly aggressive but are armed with pincer like **cerci** for a strong defense**.**

Attack 2 Damage 2
Defense 8 Health 5
Habitat: Logs, plants, trees or flowers
Special:

CLASS INSECTA

Order Isoptera

Termites live in logs and subterranean tunnels. They are highly organized social insects with a **caste** system that has workers, reproductives, and warriors. They are blind and rely on pheromones to communicate. They can digest wood with the help of microorganisms that live inside their digestive system.

Attack 1(4) Damage 1(4)
Defense 1(4) Health 1(3)
Habitat: Logs
Special:
Starts out as worker but when killed warrior is called with pheromone

Order Mantodea

Praying mantis are very formidable warriors. The have scissor-like mandibles and powerful **raptorial** forelegs. Some believe they are the most successful predators on the planet eating anything that they can grab and hold onto. They can kill prey larger than themselves. They also have camouflage that allows them to launch sneak attacks.

Attack 10 Damage 10
Defense 5 Health 10
Habitat: Plants, trees or flowers
Special:
Sneak attack makes it impossible to block or fly away from the mantis

Order Blattodea

Cockroaches are found almost everywhere and are an important part of our natural ecosystems. They get a bad reputation because some species have adapted to living off of human waste in our dwellings. They are incredibly fast runners with **cursorial** legs propelling them along. They are not powerful fighters even though they are close relatives to the praying mantis.

Attack 5 Damage 3
Defense 6 Health 7
Habitat: Any besides water
Special:
They are not strong fliers but the can run away instead of flying away with the same effect

CLASS INSECTA
Order Hemiptera

Family Corixidae

Water boatman spend their live swimming in ponds and lakes near the shore. They feed on plants and algae with their straw like mouthparts. They use 2 pair of hind legs to paddle forward.

Attack 2 Damage 2
Defense 5 Health 5
Habitat: water
Special:
Can only be attacked by another aquatic insect
Can only attack aquatic insects

Family Notonectidae

These backswimmers use their rear legs to swim upside down spending their life in the water. They are savage predators who sneak attack their prey by floating up to them from underneath. Once they have their prey they suck the life out of them using their straw like mouthparts.

Attack 5 Damage 5
Defense 5 Health 5
Habitat: water
Special:
Can only be attacked by another aquatic insect
Can only attack aquatic insects
Sneak attack makes it impossible to block

Family Belostomatidae

These giant water bugs are formidable. They catch prey with their **raptorial** front leg and drain the life out of them with their straw like mouthparts. These insects can be extremely large and have been known to kill fish for a meal.

Attack 10 Damage 20
Defense 8 Health 10
Habitat: water
Special:
Can only be attacked by another aquatic insect
Can only attack aquatic insects

CLASS INSECTA
Order Hemiptera

Family Gerridae

Water striders spend their life effortlessly skating along the surface of the water feeding on insects that fall onto the water. These use their front legs to capture and straw like mouthparts to drain.

Attack 2 Damage 2
Defense 5 Health 3
Habitat: water
Special:
Can only be attacked by another aquatic insect
Can only attack aquatic insects

Family Reduviidae or Nabidae

These insects come is several shapes and sizes and are often called assassin bugs, thread legged bugs, or ambush bugs. They all have something in common: they are savage hunters. They catch their prey by surprise with **raptorial** front legs and pierce them with their **rostrum** sucking the life out of them.

Attack 10 Damage 10
Defense 8 Health 8
Habitat: tree, plants or flowers
Special:
Sneak attack makes it impossible to defend or fly away

Family Miridae, Lygaeidae, Rhopalidae, Coreidae or Pentatomidae

These plant bugs, seed bugs, and leaf-footed bugs are very common and found on plants everywhere. They pierce plants with their straw like mouthparts and drink the nutrients.

Attack 1 Damage 2
Defense 2 Health 2
Habitat: tree, plants or flowers
Special:

CLASS INSECTA
Order Hemiptera

Family Aphididae

These tiny plant suckers are quite delicate but they can reproduce quickly. As they drink from plants they excrete a sweet juice called honeydew. This juice attracts ants which will protect the aphids to guard their supply of the honeydew.

Attack 0 Damage 0
Defense 1 Health 1
Habitat: tree, plants or flowers
Special:
Every round an aphid is in play add another aphid counter
If you have an ant in play when an aphid is attacked the attacker is attacked by your ant but attack does not tilt ant

Family Cicadidae

Cicadas spend most of their life underground as immatures sucking tree roots. Some spend 17 years underground emerging all at once in the summer. These insects are robust and fill the air with their sounds produced by using a structure called a **tymbal.** Their courtship song is incredibly loud.

Attack 3 Damage 5
Defense 5 Health 8
Habitat: trees
Special:
Sonic blast will stun any warrior for two full rounds

Family Fulgoridae, Flatidae, Membracidae or Cicadellidae

These hoppers jump from plant to plant using their straw like mouthparts to draw nutrients from plants. Some are brightly colored and some are camouflaged but they can all leap when necessary to avoid harm.

Attack 2 Damage 3
Defense 6 Health 5
Habitat: tree, plants or flowers
Special:
Jump allows avoiding one attack per round without being tilted

CLASS INSECTA
Order Coleoptera

Family Dytiscidae

The predaceous diving beetle spends most of its time in the water eating anything it can grab including small fish. They have hard and smooth **elytra** that makes them streamlined. They use their paddle-like hind legs to propel themselves through the water.

Attack 8 Damage 8
Defense 15 Health 10
Habitat: water
Special:
Can only be attacked by another aquatic insect
Can only attack aquatic insects

Family Gyrinidae

Whirlygig beetles are rapid swimmers that can swim equally well under the water or on the surface. They are often seen swimming erratically as they scavenge for any insects that have fallen in the water.

Attack 4 Damage 4
Defense 8 Health 8
Habitat: water
Special:
Can only be attacked by another aquatic insect
Can only attack aquatic insects
Can swim away from attacker similar to the fly away ability

Family Carabidae

These beetles are incredibly common. They are usually called ground beetles but certain types have the name tiger beetle. Many are excellent hunters and eat insects, **larvae**, snails, and worms. They have **cursorial** legs making them very fast runners. They can be found in many different habitats but are often found under logs, leaves, and other moist places.

Attack 8 Damage 7
Defense 8 Health 8
Habitat: Any besides water
Special:
They can run away similar to the fly away ability

CLASS INSECTA
Order Coleoptera

Family Passalidae

The bess beetles are found living in decaying logs where they take very good care of their young. This social behavior is rather uncommon for beetles. They feed their young decaying wood mixed with their saliva. While not aggressive fighters, they are hard shelled and ready to defend.

Attack 4 Damage 4
Defense 15 Health 12
Habitat: logs
Special:

Family Meloidae

The blister beetle is found feeding on plants and in flowers. They are seemingly helpless with their soft **elytra** but do not let this fool you. The blister beetle secretes a nasty fluid that can cause pain and blistering on attackers. This defense make them quite formidable.

Attack 3 Damage 3
Defense 5 Health 8
Habitat: tree, plants or flowers
Special:
When attacked the attacker is burned for 5 points of damage

Family Silphidae

The carrion beetle is found on the decomposing remains of animals. They eat **carrion** and also lay eggs on the the decaying flesh so their young can eat when they hatch. Some of these beetles exhibit great strength, burying the dead bodies of smaller animals..

Attack 3 Damage 5
Defense 5 Health 8
Habitat: carrion
Special:

CLASS INSECTA

Order Coleoptera

Family Elateridae

The click beetles have hard **elytra** and a low profile. They are **phytophagous** and found on many different types of plants. They have a neat trick that they use to flip themselves upright and to scare predators. They flex their bodies and flip with a clicking noise being produced by the action. While it can be startling, they are harmless.

Attack 2 Damage 2
Defense 7 Health 7
Habitat: tree, plants or flowers
Special:
When attacked they can choose to click avoiding the attack once per round without being tilted

Family Lampyridae

Lighting bugs or fireflies dazzle as they fill the summer air with flashing light. They produce this light to attract mates. The light is emitted from special organs in the end of their abdomens. They can be found on vegetation during the day but take flight at night to find the opposite sex.

Attack 2 Damage 2
Defense 3 Health 4
Habitat: tree, plants or flowers
Special:
They can dazzle their attackers avoiding attacks twice per round

Family Coccinellidae

The ladybird beetles are common and recognizable because of their convex shape. Many of these ladybird beetle are specialized aphid hunters. They will walk into a group of aphids and decimate.

Attack 4 Damage 4
Defense 8 Health 8
Habitat: plants or flowers
Special:
When attacking aphids they automatically kill up to five of them

CLASS INSECTA
Order Coleoptera

Family Cerambycidae

They look similar to Chrysomelidae but these long-horned beetles have very long antennae. The **larvae** of this family are typically wood borers and can cause major damage to trees. The adults are typically flower feeders.

Attack 3 Damage 3
Defense 7 Health 7
Habitat: trees or flowers
Special:

Family Staphylinidae

Rove beetles are commonly found in leaf litter, on or near carrion, and decaying material. They are predaceous and often feed on maggots. They have short **elytra** so their abdomens are somewhat unprotected.

Attack 3 Damage 3
Defense 2 Health 3
Habitat: Carrion or leaf litter
Special:

Family Scarabaeidae

The scarab beetle can be found in many different habitats. Many eat decomposing matter, including **dung,** but some are plant feeders. They have a hard protective **elytra** but are not very formidable attackers.

Attack 3 Damage 3
Defense 6 Health 3
Habitat: Any except water and dwellings
Special:

CLASS INSECTA

Order Coleoptera

Family Chrysomelidae

The leaf beetles are **phytophagous** being found on the plants they eat. They are very common and many are colorful. They are not particularly good at combat or defense but are easy to find so capture photos of many different individuals to fill your ranks.

Attack 2 Damage 2
Defense 3 Health 4
Habitat: plants or flowers
Special:

Family Lucanidae

Stag beetles are found in the forest feeding on the juices of decaying wood. They are like little tanks with thick **elytra** and armed with large and powerful mandibles. These warriors are not easily defeated.

Attack 7 Damage 10
Defense 12 Health 10
Habitat: Trees or logs
Special:

Family Curculionidae

Weevils are very diverse and found almost everywhere. They are **phytophagous** using their snout like mouthparts to chew into plants, fruit, seeds, and even very hard nuts. While they are not great fighters they have extremely hard **elytra** making it difficult to damage them.

Attack 1 Damage 2
Defense 12 Health 5
Habitat: Any except water
Special:

CLASS INSECTA

Order Hymenoptera

Clade Anthophila

Bees come in many shapes and sizes. Some are social having complex communities and some are solitary. They all rely on nectar and pollen to feed themselves and their young. They are always busy preparing nests and hives of many different styles. In their nest they create cells that protect their developing young as they mature to adults. **Eusocial** bees create hives of thousands of individuals with a queen in charge. Individuals from the same hive will protect each other. Many of them can sting delivering venom and pain. They are also strong flyers zipping from flower to flower and then back to their nests.

Attack 5 Damage 7
Defense 7 Health 5
Habitat: flowers
Special:
Can fly away
If attacked and their are other bees on the team the attacker will suffer 2 points of damage from each of them

Superfamily Vespoidea

Wasps come in many shapes and size. Some are **eusocial**, solitary, predatory, scavengers, or **parasitoids**. Most have stingers that can deliver powerful venom and pain. Individuals from the same nest will protect each other sometimes sending out pheromone alarms to prompt vicious attacks.

Attack 7 Damage 9
Defense 7 Health 7
Habitat: Any besides water
Special:
Can fly away
If attacked and their are other wasp on the team the attacker will suffer 3 points of damage from each of them

CLASS INSECTA

Order Hymenoptera

Family Formicidae

Ants are well known and everywhere. They are all **eusocial** with complex cities made up of queens, males and workers. Ants will defend their cities to the death with focused and coordinated attacks. This is part of the reason they are an incredibly successful family of insects. They do not have wings except during **nuptial** flights. They are strong and armed with powerful mandibles. All ants bite and some have painful stings. Ant colonies can easily overwhelm any attackers.

Attack 7 Damage 9
Defense 7 Health 7
Habitat: Any besides water
Special:
If attacked and not killed 5 more ants come into play on that team. This only happens once for the original ant the was brought into play.

CLASS INSECTA

Order Lepidoptera

Butterflies and moths have wings that are covered with scales allowing them to sometimes escape being caught in in spiders webs. Some of them have drab wings but many are beautifully colored. Butterflies are primarily **diurnal** and moths are **nocturnal**.
The adults are pollinators, sipping nectar from flowers with long mouthparts but many of the **larvae** are **phytophagous** munching away at plant foliage. In fact their **larvae** are such voracious plant eaters that they can be a serious pest of agriculture and the forest.

Attack 1 Damage 1
Defense 6 Health 4
Habitat: flowers
Special:
Can fly away
Can fly away from spiders
Can choose to have their larvae destroy one tree or plant card

CLASS INSECTA

Order Diptera

Family Tipulidae

Crane flies are extremely common. They look like large mosquitoes but are not. Their young are called maggots and eat decomposing plant material but the adults often do not eat. They are fragile insects not very good at attack or defense.

Attack 1 Damage 1
Defense 2 Health 2
Habitat: decomposing organic matter
Special:
Can fly away

Family Stratiomyidae

Adult soldier flies are usually found feeding on the nectar of flowers. Their young are called maggots and eat decomposing plant material. They can be mistaken for wasps but do not sting. They are not particularly good fighters but are not fragile.

Attack 1 Damage 1
Defense 2 Health 2
Habitat: decomposing organic matter or flowers
Special:
Can fly away

Family Tabanidae

These solid-bodied insects are commonly called horse flies or deer flies. The males feed on flowers while females feed on blood to help produce young maggots. They are strong flyers and can travel great distances.

Attack 3 Damage 4
Defense 4 Health 6
Habitat: decomposing organic matter or flowers
Special:
Can fly away

CLASS INSECTA

Order Diptera

Family Syrphidae

Flower flies are found wherever there are flowers. They hover about sipping nectar. They often look like bees but have no sting. They are not particularly good at combat or defense but are easy to find so capture photos of many different individuals to fill your ranks.

Attack 4 Damage 2
Defense 7 Health 2
Habitat: flowers
Special:
Can fly away

Family Muscidae, Sarcophagidae or Calliphoridae

All of these families have the typical shape we associate with the flies we see everywhere. The are stout bodied and have a somewhat triangular wing shape. Their common names are house fly, flesh fly, and blow fly. These flies are often seen zipping about garbage, picnics, and **carrion**. They are looking for opportunities to sponge up some food and lay eggs. The maggots of these flies will rapidly consume the **carrion** or decaying organic matter they hatch on.

Attack 4 Damage 2
Defense 7 Health 2
Habitat: Dwellings, Carrion or Decomposing organic matter
Special:
Can fly away
Can sacrifice Carrion or Decomposing organic matter to bring a fly back from the carbon cycle

Glossary

(definitions from Merriam-Webster.com)

Bilateral symmetry- symmetry in which similar anatomical parts are arranged on opposite sides of a median axis so that only one plane can divide the individual into essentially identical halves

Carrion-dead and putrefying flesh

Caste- a specialized form (such as the worker of an ant or bee) of a polymorphic social insect that carries out a particular function in the colony

Cerci- either of a pair of simple or segmented appendages at the posterior end of various arthropods that usually act as sensory organs

Chela- a pincerlike organ or claw borne by a limb of a crustacean or arachnid

Chelicerae- one of the anterior pair of appendages of an arachnid often specialized as fangs

Chitin- a horny polysaccharide $(C_8H_{13}NO_5)_n$ that forms part of the hard outer integument especially of insects, arachnids, and crustaceans

Clade- a group of biological taxa (such as species) that includes all descendants of one common ancestor

Cursorial- adapted to or involving running

Detritivores- an organism (such as an earthworm or a fungus) that feeds on dead and decomposing organic matter

Diurnal- *biology* : active chiefly in the daytime

Dung- the feces of an animal

Elytra- one of the anterior wings in beetles and some other insects that serve to protect the posterior pair of functional wings

Eusocial- living in a cooperative group in which usually one female and several males are reproductively active and the non-breeding individuals care for the young or protect and provide for the group

Exoskeleton- an external supportive covering of an animal (such as an arthropod)

Family- a group of related plants or animals forming a category ranking above a genus and below an order and usually comprising several to many genera

Larva- the immature, wingless, and often wormlike feeding form that hatches from the egg of many insects, alters chiefly in size while passing through several molts, and is finally transformed into a pupa or chrysalis from which the adult emerges

Mandibles- any of various invertebrate mouthparts serving to hold or bite food materials
especially : either member of the anterior pair of mouth appendages of an arthropod often forming strong biting jaws

Membranous- thin, pliable, and often somewhat transparent

Naiads- an aquatic insect nymph (as of a mayfly, dragonfly, damselfly, or stone fly)

Niches- *1-* a habitat supplying the factors necessary for the existence of an organism or species *2-* the ecological role of an organism in a community especially in regard to food consumption

Nocturnal- active at night

Nuptial- characteristic of or occurring in the breeding season

Order- a category of taxonomic classification ranking above the family and below the class

Parasitoids- an insect and especially a wasp that completes its larval development within the body of another insect eventually killing it and is free-living as an adult
phytophagous

Poikilotherm- an organism (such as a frog) with a variable body temperature that tends to fluctuate with and is similar to or slightly higher than the temperature of its environment **:** a cold-blooded organism

Prothorax- the anterior segment of the thorax of an insect

Pollinators- an agent (such as an insect) that pollinates flowers

Predators- an organism that primarily obtains food by the killing and consuming of other organisms

Raptorial- adapted to seize prey

Rostrum- the beak, snout, or proboscis of any of various insects or arachnids

Saltatorial- relating to, marked by, or adapted for leaping

Serrate- notched or toothed on the edge

Stridulation- to make a shrill creaking noise by rubbing together special bodily structures —used especially of male insects (such as crickets or grasshoppers)

Taxonomy- orderly classification of plants and animals according to their presumed natural relationships.

Telson- the terminal segment of the body of an arthropod or segmented worm

Thorax- the middle of the three chief divisions of the body of an insect

True bugs- any of an order Hemiptera of insects that have sucking mouthparts, forewings thickened at the base, and incomplete metamorphosis and are often economic pests

Tubercles- a small knobby prominence or excrescence especially on a plant or animal

Tymbal- the vibrating membrane in the shrilling organ of a cicada

Vermiculate- resembling a worm in shape

Photo Credits

Image 1
Kolihapeltis 01 Pengo.jpg: Peter Halasz Stylonurus BW.jpg: Nobu Tamura SCORPIO MAURUS PALMATUS.jpg: Guy Haimovitch Blue crab on market in Piraeus - Callinectes sapidus Rathbun 20020819-317.jpg: Wpopp Female centipede with eggs.jpg: Marshal Hedin John Kratz - Swallowtail (by-sa).jpg: John Kratz derivative work: Xvazquez, Amada44 (https://commons.wikimedia.org/wiki/File:Arthropoda.jpg), „Arthropoda“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 2
Bugboy52.40 (https://commons.wikimedia.org/wiki/File:Insect_collage.png), „Insect collage“, Labelled body parts by Patrick Natale, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 3
Shantanu Kuveskar (https://commons.wikimedia.org/wiki File:Scorpion_Photograph_By_Shantanu_Kuveskar.jpg),https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 4
André Karwath aka Aka (https://commons.wikimedia.org/wiki/File:Araneus_diadematus_(aka).jpg), „Araneus diadematus (aka)“,https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 5
Original image: Warut Siriwut, Gregory D. Edgecombe, Chirasak Sutcharit, Piyoros Tongkerd, Somsak Panha; crop by EdChem (https://commons.wikimedia.org/wiki/File:Scolopendra_cataracta_from_Zookeys.jpg), „Scolopendra cataracta from Zookeys“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 6
Totodu74 (https://commons.wikimedia.org/wiki/File:Anadenobolus_monilicornis_03.JPG), „Anadenobolus monilicornis 03“,https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 7
Filip.vidinovski (https://commons.wikimedia.org/wiki/File:House_centipede_Scutigera_coleoptrata_on_the_wall.tif), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 8
Shirley Daniella Martínez-Torres, Álvaro Eduardo Flórez Daza, Edgar Leonardo Linares-Castillo (https://commons.wikimedia.org/wiki/File:Psammodesmus_bryophorus.jpg), https://creativecommons.org/licenses/by/4.0/legalcode

Image 9
Alvesgaspar (https://commons.wikimedia.org/wiki/File:Tipulidae_April_2008-2.jpg), „Tipulidae April 2008-2“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Photo Credits

Image 10
I, Luc Viatour (https://commons.wikimedia.org/wiki/File:Tipulidae_Luc_Viatour.jpg), „Tipulidae Luc Viatour“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 11
Notafly (https://commons.wikimedia.org/wiki/File:Tabanus_eggeri.jpg), „Tabanus eggeri“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 12
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Horse_fly_Tabanus_2.jpg), „Horse fly Tabanus 2“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 13
Prosthetic Head (https://commons.wikimedia.org/wiki/File:Closeup_Robber_Fly.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 14
© 2010 Jee & Rani Nature Photography (License: CC BY-SA 4.0) (https://commons.wikimedia.org/wiki/File:Asilidae_5_by_kadavoor.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 15
Rbreidbrown (https://commons.wikimedia.org/wiki/File:Laphria_flavicollis,_a_species_of_robber_fly,_eating_a_boxelder_bug.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 16
Alvesgaspar (https://commons.wikimedia.org/wiki/File:Syrphidae_poster.jpg), „Syrphidae poster“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 17
James Lindsey at Ecology of Commanster (https://commons.wikimedia.org/wiki/File:Musca.domestica.female.jpg), „Musca.domestica.female“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 18
USDAgov (https://commons.wikimedia.org/wiki/File:Common_house_fly,_Musca_domestica.jpg), „Common house fly, Musca domestica“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 19
Calibas (https://commons.wikimedia.org/wiki/File:Green_bottle_fly.jpg), „Green bottle fly“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Photo Credits

Image 20
Saleem Hameed (https://commons.wikimedia.org/wiki/File:Sarcophagid_sal.jpg), „Sarcophagid sal“, https://creativecommons.org/licenses/by/2.5/legalcode

Image 21
Christian Fischer (https://commons.wikimedia.org/wiki/File:LepismaSaccharina.jpg), „LepismaSaccharina“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 22
James Lindsey at Ecology of Commanster (https://commons.wikimedia.org/wiki/File:Leptophlebia.marginata.subimago.jpg), „Leptophlebia.marginata.subimago“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 23
Richard Bartz, Munich aka Makro Freak Image:MFB.jpg (https://commons.wikimedia.org/wiki/File:Rhithrogena_germanica_subimago_on_Equisetum_hyemale.jpg), „Rhithrogena germanica subimago on Equisetum hyemale“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 24
Deepugn (https://commons.wikimedia.org/wiki/File:Thumbi_ira_pidikkunnu.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 25
Fir0002 (https://commons.wikimedia.org/wiki/File:Common_blue_damselfly02.jpg), „Common blue damselfly02“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 26
André Karwath aka Aka (https://commons.wikimedia.org/wiki/File:Sympetrum_flaveolum_-_side_(aka).jpg), „Sympetrum flaveolum - side (aka)“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 27
Shyamal (https://commons.wikimedia.org/wiki/File:PantalaFlavescensTalakaveri.jpg), „PantalaFlavescensTalakaveri“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 28
Aiwok (https://commons.wikimedia.org/wiki/File:Libellula_quadrimaculata_m1.jpg), „Libellula quadrimaculata m1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 29
Thegreenj (https://commons.wikimedia.org/wiki/File:Ceuthophiluscricket.jpg), „Ceuthophiluscricket“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Photo Credits

Image 30
Wofl (https://commons.wikimedia.org/wiki/File:Phaneroptera_falcata.jpg), „Phaneroptera falcata“, https://creativecommons.org/licenses/by-sa/2.0/de/legalcode

Image 31
Quartl (https://commons.wikimedia.org/wiki/File:Conocephalus_fuscus_qtl1.jpg), „Conocephalus fuscus qtl1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 32
Vishalsh521 (https://commons.wikimedia.org/wiki/File:Katydid_india.jpg), „Katydid india“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 33
Aiwok (https://commons.wikimedia.org/wiki/File:Tetrix_subulata_2.JPG), „Tetrix subulata 2“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 34
Sean Wallace (https://commons.wikimedia.org/wiki/File:Crickets_feeding_on_carrot.jpg), „Crickets feeding on carrot“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 35
Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled GNU Free Documentation License.http://www.gnu.org/copyleft/fdl.htmlGFDLGNU Free Documentation Licensetruetrue This file is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license. You are free: to share – to copy, distribute and transmit the work to remix – to adapt the work Under the following conditions: attribution – You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. share alike – If you alter, transform, or build upon this work, you may distribute the resulting work only under the same or similar license to this one. This licensing tag was added to this file as part of the GFDL licensing update.http://creativecommons.org/licenses/by-sa/3.0/CC-BY-SA-3.0Creative Commons Attribution-Share Alike 3.0truetrue Taken or created by Fir0002 (https://commons.wikimedia.org/wiki/File:Ctenomorpha_chronus02.jpg), „Ctenomorpha chronus02“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 36
L. Shyamal (https://commons.wikimedia.org/wiki/File:Earwig_iruppu.jpg), „Earwig iruppu“, https://creativecommons.org/licenses/by/2.5/legalcode

Image 37
Luis Miguel Bugallo Sánchez (https://commons.wikimedia.org/wiki/File:Forficula_Auricularia_en_Bastavales,_Galiza_090818_002.jpg), „Forficula Auricularia en Bastavales, Galiza 090818 002“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 38
Pudding4brains (https://commons.wikimedia.org/wiki/File:F-auricularia_M_-_HngFBK20080915_A023.jpg), „F-auricularia M - HngFBK20080915 A023“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Photo Credits

Image 39
Photo by Scott Bauer. (https://commons.wikimedia.org/wiki/File:Coptotermes_formosanus_shiraki_USGov_k8204-7.jpg), „Coptotermes formosanus shiraki USGov k8204-7“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-US

Image 40
Shiva shankar (https://commons.wikimedia.org/wiki/File:Praying_mantis_india.jpg), „Praying mantis india“, https://creativecommons.org/licenses/by-sa/2.0/legalcode

Image 41
I, Luc Viatour (https://commons.wikimedia.org/wiki/File:Tenodera_sinensis_5_Luc_Viatour.jpg), „Tenodera sinensis 5 Luc Viatour“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 42
Gary Alpert (https://commons.wikimedia.org/wiki/File:American-cockroach.jpg), „American-cockroach“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 43
Lmbuga (https://commons.wikimedia.org/wiki/File:Blattodea._Cascuda._Santiago_de_Compostela_1.jpg), „Blattodea. Cascuda. Santiago de Compostela 1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 44
Happy1892 (https://commons.wikimedia.org/wiki/File:Parcoblatta_divisa_and_Parcoblatta_pennsylvanica_adult_males_NC.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 45
James Lindsey at Ecology of Commanster (https://commons.wikimedia.org/wiki/File:Hesperocorixa.castanea.-.lindsey.jpg), „Hesperocorixa.castanea.-.lindsey“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 46
Frank Vassen from Brussels, Belgium (https://commons.wikimedia.org/wiki/File:Giant_water_bug_(Belostomatidae),_Vohimana_reserve,_Madagascar_(13569458513).jpg), „Giant water bug (Belostomatidae), Vohimana reserve, Madagascar (13569458513)“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 47
Bruce J. Marlin (https://commons.wikimedia.org/wiki/File:Water_strider_G_remigis.jpg), „Water strider G remigis“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Photo Credits

Image 48
Riechvaugen (https://commons.wikimedia.org/wiki/File:Zelus_bug_nymph.jpg), „Zelus bug nymph“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 49
Goula Marta, Sesma José-Manuel, Vivas Luis (https://commons.wikimedia.org/wiki/File:Zelus_renardii_-_ZooKeys-319-093-g001.jpeg), „Zelus renardii - ZooKeys-319-093-g001“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 50
Emma.hans (https://commons.wikimedia.org/wiki/File:Wheel_bug_in_Columbus_Ohio.jpg), cropped by Patrick Natale, https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 51
Lindawipedia (https://commons.wikimedia.org/wiki/File:Wheelbugattackingstinkbug.JPG), „Wheelbugattackingstinkbug“, https://creativecommons.org/publicdomain/zero/1.0/legalcode

Image 52
IronChris (https://commons.wikimedia.org/wiki/File:IC_Phymata_pennsylvanica.JPG), „IC Phymata pennsylvanica“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 53
Alvesgaspar (https://commons.wikimedia.org/wiki/File:Bug_July_2009-1.jpg), „Bug July 2009-1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 54
Richard Bartz (https://commons.wikimedia.org/wiki/File:Eichen-Schmuckwanze_Rhabdomiris_striatellus_2.jpg), „Eichen-Schmuckwanze Rhabdomiris striatellus 2“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 55
Alexf (https://commons.wikimedia.org/wiki/File:Milkweedbug1.jpg), „Milkweedbug1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 56
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Box_elder_bug.jpg), „Box elder bug“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 57
Katja Schulz from Washington, D. C., USA (https://commons.wikimedia.org/wiki/File:Green_Plant_Bug_(15365110324).jpg), „Green Plant Bug (15365110324)“, https://creativecommons.org/licenses/by/2.0/legalcode

Photo Credits

Image 58
Sandy Rae (https://commons.wikimedia.org/wiki/File:Nezara_viridula2.jpg), „Nezara viridula2“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 59
Hectonichus (https://commons.wikimedia.org/wiki/File:Pentatomidae_-_Halyomorpha_halys-001.JPG), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 60
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Acanthocephala_terminalis.JPG), „Acanthocephala terminalis“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 61
Didier Descouens (https://commons.wikimedia.org/wiki/File:Leptoglossus_occidentalis_MHNT_Profil.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 62
Michael Becker (https://commons.wikimedia.org/wiki/File:Nabis_rugosus_2006.05.28_13.47.08-p5280196.jpg), „Nabis rugosus 2006.05.28 13.47.08-p5280196“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 63
soerfm (https://commons.wikimedia.org/wiki/File:Perho.jpg), „Perho“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 64
Jim Conrad (https://commons.wikimedia.org/wiki/File:Planthopper-Flatidae.jpg), „Planthopper-Flatidae“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-author

Image 65
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Ceresa_taurina.JPG), „Ceresa taurina“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 66
Keith Edkins (https://commons.wikimedia.org/wiki/File:Agallia_consobrina_GS2.jpg), „Agallia consobrina GS2“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 67
Ryan Kaldari (https://commons.wikimedia.org/wiki/File:Oncometopia_orbona_Kaldari.jpg), „Oncometopia orbona Kaldari“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Photo Credits

Image 68
Rasbak (https://commons.wikimedia.org/wiki/File:Aphis_fabae,_zwarte_bonenluis_(1).jpg), „Aphis fabae, zwarte bonenluis (1)“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 69
Rasbak (https://commons.wikimedia.org/wiki/File:Melige_koolluis_op_boerenkool,_Brevicoryne_brassicae_on_curley_kale_(1).jpg), „Melige koolluis op boerenkool, Brevicoryne brassicae on curley kale (1)“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 70
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Tibicen_linnei.jpg), „Tibicen linnei“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 71
Soebe (https://commons.wikimedia.org/wiki/File:Carabus_auratus_with_prey.jpg), „Carabus auratus with prey“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 72
Patrick Coin (Patrick Coin) (https://commons.wikimedia.org/wiki/File:Brachinus_spPCCA20060328-2821B.jpg), „Brachinus spPCCA20060328-2821B“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 73
No machine-readable author provided. Shyamal assumed (based on copyright claims). (https://commons.wikimedia.org/wiki/File:Cicindelid_bangalore.jpg), „Cicindelid bangalore“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 74
Yves Bousquet (https://commons.wikimedia.org/wiki/File:Broscus_cephalotes_L._-_ZooKeys-245-001-g020.jpeg), „Broscus cephalotes L. - ZooKeys-245-001-g020“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 75
Didier Descouens (https://commons.wikimedia.org/wiki/File:Carabus_nemoralis_MHNT_Dos.jpg), „Carabus nemoralis MHNT Dos“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 76
Cody Hough (https://commons.wikimedia.org/wiki/File:Harpalini.jpg), „Harpalini“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 77
Edmund Reitter creator QS:P170,Q79164 (https://commons.wikimedia.org/wiki/File:Reitter_Ocys_u.a..jpg), „Reitter Ocys u.a.“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-old

Photo Credits

Image 78
No machine-readable author provided. Kugamazog~commonswiki assumed (based on copyright claims). (https://commons.wikimedia.org/wiki/File:Verres_corticicola_variation_sjh.jpg), „Verres corticicola variation sjh“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 79
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Black_blister_beetle.jpg), „Black blister beetle“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 80
Mike (https://commons.wikimedia.org/wiki/File:Tegrodera_latecincta_yavapai.jpg), „Tegrodera latecincta yavapai“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 81
Mike (https://commons.wikimedia.org/wiki/File:Lytta_auriculata.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 82
D. Gordon E. Robertson (https://commons.wikimedia.org/wiki/File:Short-winged_Blister_Beetle.jpg), „Short-winged Blister Beetle“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 83
Derek S. Sikes 2005 (http://tolweb.org/Silphidae), Large carrion and burying beetles Attribution-NonCommercial-ShareAlike 3.0 Unported (CC BY-NC-SA 3.0)

Image 84
Hectonichus (https://commons.wikimedia.org/wiki/File:Elateridae_-_Actenicerus_sjaelandicus-1.JPG), „Elateridae - Actenicerus sjaelandicus-1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 85
Henryhartley (https://commons.wikimedia.org/wiki/File:Eyed_Click_Beetle_Alaus_oculatus_056428.jpg), „Eyed Click Beetle Alaus oculatus 056428“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 86
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Photuris_lucicrescens.jpg), „Photuris lucicrescens“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 87
Emmanuelm at English Wikipedia (https://commons.wikimedia.org/wiki/File:Firefly_composite.jpg), „Firefly composite“, https://creativecommons.org/licenses/by/3.0/legalcode

Photo Credits

Image 88
Gilles San Martin from Namur, Belgium (https://commons.wikimedia.org/wiki/File:Coccinella_magnifica01.jpg), „Coccinella magnifica01“, https://creativecommons.org/licenses/by-sa/2.0/legalcode

Image 89
Clinton & Charles Robertson from Del Rio, Texas & College Station, TX, USA (https://commons.wikimedia.org/wiki/File:Lady_beetle_taking_flight.jpg), „Lady beetle taking flight“, https://creativecommons.org/licenses/by-sa/2.0/legalcode

Image 90
Olei (https://commons.wikimedia.org/wiki/File:Psyllobora.vigintiduopunctata.6920.jpg), „Psyllobora.vigintiduopunctata.6920“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 91
Beatriz Moisset (https://commons.wikimedia.org/wiki/File:Plagiometriona_clavata.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 92
beentree (https://commons.wikimedia.org/wiki/File:Crioceris_duodecimpunctata_beentree.jpg), „Crioceris duodecimpunctata beentree“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 93
Pollinator at English Wikipedia (https://commons.wikimedia.org/wiki/File:Striped_cuke_beetle_1119.JPG), „Striped cuke beetle 1119“, https://creativecommons.org/licenses/by/2.5/legalcode

Image 94
Judy Gallagher (https://commons.wikimedia.org/wiki/File:Dogbane_Beetle_-_Chrysochus_auratus,_Meadowwood_Farm_SRMA,_Mason_Neck,_Virginia.jpg), „Dogbane Beetle - Chrysochus auratus, Meadowwood Farm SRMA, Mason Neck, Virginia“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 95
幺立申 Yao Lishen (https://commons.wikimedia.org/wiki/File:Anoplophora_chinensis.jpg), „Anoplophora chinensis“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 96
Basile Morin (https://commons.wikimedia.org/wiki/File:Gerania_bosci_bosci_(longhorn_beetle)_on_a_coconut_(focus_stacking).jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 97
JohnOwens (https://commons.wikimedia.org/wiki/File:Tetraopes_tetrophthalmus-1.jpg), „Tetraopes tetrophthalmus-1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 98
see in description (https://commons.wikimedia.org/wiki/File:Jacobs14.jpg), „Jacobs14“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-old

Photo Credits

Image 99
Daniel Ullrich, Threedots (https://commons.wikimedia.org/wiki/File:Ocypus_spec.jpg), „Ocypus spec“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 100
Spongymesophyll (https://commons.wikimedia.org/wiki/File:Palaminus_sp_149592_dorsal.tif), „Palaminus sp 149592 dorsal“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 101
Line Sabroe from Denmark (https://commons.wikimedia.org/wiki/File:Tachyporus_obtusus_(15657459723).jpg), „Tachyporus obtusus (15657459723)“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 102
Edmund Reitter creator QS:P170,Q79164 (https://commons.wikimedia.org/wiki/File:Reitter-1908_table74.jpg), „Reitter-1908 table74“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-old

Image 103
Didier Descouens (https://commons.wikimedia.org/wiki/File:Copris_lunaris._MHNT.jpg), „Copris lunaris. MHNT“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 104
Bruce Marlin (https://commons.wikimedia.org/wiki/File:Popillia_japonica.jpg), „Popillia japonica“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 105
Stephen Friedt (https://commons.wikimedia.org/wiki/File:Green_june_beetle2.jpg), „Green june beetle2“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 106
keusju (https://commons.wikimedia.org/wiki/File:Hex.JPG), „Hex“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Image 107
No machine-readable author provided. Kugamazog~commonswiki assumed (based on copyright claims). (https://commons.wikimedia.org/wiki/File:Dorcus_curvidens_hopei_sjh.jpg), „Dorcus curvidens hopei sjh“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 108
Lukas Jonaitis from Vilnius, Lithuania (https://commons.wikimedia.org/wiki/File:Flickr_-_Lukjonis_-_Bug-Cionus_hortulanus.jpg), „Flickr - Lukjonis - Bug-Cionus hortulanus“, https://creativecommons.org/licenses/by/2.0/legalcode

Photo Credits

Image 109
Janet Graham (https://commons.wikimedia.org/wiki/File:Dorytomus_melanophthalmus,_Gronant_dunes,_North_Wales,_Sept_2015_(21033395533).jpg), „Dorytomus melanophthalmus, Gronant dunes, North Wales, Sept 2015 (21033395533)“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 110
Janet Graham (https://commons.wikimedia.org/wiki/File:Magdalis_armigera,_Graig-fechan,_North_Wales,_July_2015_-_Flickr_-_janetgraham84.jpg), „Magdalis armigera, Graig-fechan, North Wales, July 2015 - Flickr - janetgraham84“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 111
Andreas Trepte (https://commons.wikimedia.org/wiki/File:Apis_mellifera_Western_honey_bee.jpg), „Apis mellifera Western honey bee“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 112
I, Tony Wills (https://commons.wikimedia.org/wiki/File:Bumblebee_05.JPG), „Bumblebee 05“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 113
Jodelet / Lépinay (https://commons.wikimedia.org/wiki/File:Megachile_rotundata.JPG), „Megachile rotundata“, cropped by Patrick Natale, https://creativecommons.org/licenses/by-sa/2.0/fr/deed.en

Image 114
Beatriz Moisset (https://commons.wikimedia.org/wiki/File:Osmia_cornifrons.5.1.08.w.jpg), „Osmia cornifrons.5.1.08.w“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 115
Alvesgaspar (https://commons.wikimedia.org/wiki/File:Bee_September_2007-6.jpg), „Bee September 2007-6“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 116
Didier Descouens (https://commons.wikimedia.org/wiki/File:Halictus_scabiosae_MHNT.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 117
Alvesgaspar (https://commons.wikimedia.org/wiki/File:Bee_February_2008-3.jpg), „Bee February 2008-3“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 118
Pjt56 --- If you use the picture outside Wikipedia I would appreciate a short e-mail to pjt56@gmx.net or a message on my discussion page (https://commons.wikimedia.org/wiki/File:Dipogon_subintermedius-pjt1.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 119
Didier Descouens (https://commons.wikimedia.org/wiki/File:Megascolia_procer_MHNT_dos.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Photo Credits

Image 120
Richard Bartz, Munich aka Makro Freak (https://commons.wikimedia.org/wiki/File:Vespula_germanica_Horizontalview_Richard_Bartz.jpg), „Vespula germanica Horizontalview Richard Bartz“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 121
Duncan Timiney (https://commons.wikimedia.org/wiki/File:Wasp_stripping_wood.jpg), „Wasp stripping wood“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 122
Beatriz Moisset (https://commons.wikimedia.org/wiki/File:2919baldf.w.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 123
Gunther Tschuch (https://commons.wikimedia.org/wiki/File:Chyphotes_m.jpg), „Chyphotes m“, https://creativecommons.org/licenses/by-sa/2.5/legalcode 08-3.jpg), „Bee February 2008-3“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 124
Stephen Ausmus (https://commons.wikimedia.org/wiki/File:Fire_ants_01.jpg), „Fire ants 01“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-US

Image 125
NoahElhardt (https://commons.wikimedia.org/wiki/File:Camponotus_sericeus_Senegal.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 126
fesoj (https://commons.wikimedia.org/wiki/File:Fesoj_-_Papilio_machaon_(by).jpg), „Fesoj - Papilio machaon (by)“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 127
Ernie (https://commons.wikimedia.org/wiki/File:AD2009Aug01_Vanessa_atalanta_01.jpg), „AD2009Aug01 Vanessa atalanta 01“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Image 128
Fir0002 at English Wikipedia (https://commons.wikimedia.org/wiki/File:Emperor_Gum_Moth.jpg), „Emperor Gum Moth“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 129
Insects Unlocked creator QS:P170,Q33236104 (https://commons.wikimedia.org/wiki/File:Assorted_Moths_(Lepidoptera)_in_the_University_of_Texas_Insect_Collection_(22281153644)_(cropped).jpg), „Assorted Moths (Lepidoptera) in the University of Texas Insect Collection (22281153644) (cropped)“, https://creativecommons.org/publicdomain/zero/1.0/legalcode

Image 130
Alvesgaspar (https://commons.wikimedia.org/wiki/File:Moth_September_2008-3.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Photo Credits

Image 131
Zuhairali (https://commons.wikimedia.org/wiki/File:Moth_kerala.jpg), „Moth kerala“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 132
NNeilAlieNN (https://commons.wikimedia.org/wiki/File:Giant_grey_moth.png), „Giant grey moth“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 133
Kevincollins123 (https://commons.wikimedia.org/wiki/File:LeopardMothBlueSpots_edit2.jpg), „LeopardMothBlueSpots edit2“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 134
Super.lukas (https://commons.wikimedia.org/wiki/File:Beautiful_butterfly_2-cutout.JPG), „Beautiful butterfly 2-cutout“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 135
Quartl (https://commons.wikimedia.org/wiki/File:Heliconius_hecale_qtl1.jpg), „Heliconius hecale qtl1“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 136
Sarefo (https://commons.wikimedia.org/wiki/File:Pieris.rapae.mounted.jpg), „Pieris.rapae.mounted“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 137
The original uploader was Loggi at German Wikipedia. (https://commons.wikimedia.org/wiki/File:Dytiscidae.png), „Dytiscidae“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-old

Image 138
Forestowlet (https://commons.wikimedia.org/wiki/File:Whirligig_Beetle_02.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 139
This image is created by user Wim Rubers at waarneming.nl, a source of nature observations in the Netherlands. (https://commons.wikimedia.org/wiki/File:Cybister_lateralimarginalis_(Dytiscidae)_-_(imago),_Berkenwoude,_the_Netherlands.jpg), „Cybister lateralimarginalis (Dytiscidae) - (imago), Berkenwoude, the Netherlands“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 140
Didier Descouens (https://commons.wikimedia.org/wiki/File:Notonecta_maculata_MHNT.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 141
E. van Herk (https://commons.wikimedia.org/wiki/File:Notonecta_glauca01.jpg), „Notonecta glauca01“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Photo Credits

Image 142
Prosthetic Head (https://commons.wikimedia.org/wiki/File:Wasp_Ants.jpg), https://creativecommons.org/licenses/by-sa/4.0/legalcode

Image 143
I, Luc Viatour (https://commons.wikimedia.org/wiki/File:Tenodera_sinensis_2_Luc_Viatour.jpg), „Tenodera sinensis 2 Luc Viatour“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 144
I, Tony Wills (https://commons.wikimedia.org/wiki/File:Wasp_and_spider_02.jpg), „Wasp and spider 02“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 145
Pengo (https://commons.wikimedia.org/wiki/File:Biological_classification_L_Pengo_vflip.svg), „Biological classification L Pengo vflip“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-user

Image 146
Rayukk at English Wikipedia (https://commons.wikimedia.org/wiki/File:IPhone6_silver_frontface.png), „IPhone6 silver frontface“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 147
Bill Ebbesen (https://commons.wikimedia.org/wiki/File:Photographic_lenses_front_view.jpg), „Photographic lenses front view“, https://creativecommons.org/licenses/by/3.0/legalcode

Image 148
Donar Reiskoffer (https://commons.wikimedia.org/wiki/File:Brussels_Zonienwoud.jpg), „Brussels Zonienwoud“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 149
Nikater (https://commons.wikimedia.org/wiki/File:Blumenwiese_bei_Obermaiselstein05.jpg), „Blumenwiese bei Obermaiselstein05“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Image 150
Tomas Castelazo (https://commons.wikimedia.org/wiki/File:Baja_California_Desert.jpg), „Baja California Desert“, https://creativecommons.org/licenses/by-sa/2.5/legalcode

Image 151
eisenbergalex (https://commons.wikimedia.org/wiki/File:Hampstead_Ponds_(171329664).jpg), „Hampstead Ponds (171329664)“, https://creativecommons.org/licenses/by/2.0/legalcode

Image 152
blucolt (https://commons.wikimedia.org/wiki/File:SpearfishCreek.jpg), „SpearfishCreek“, https://creativecommons.org/licenses/by-sa/2.0/legalcode

Image 153
Lisa Heindel (https://commons.wikimedia.org/wiki/File:Harvey_LA_back_yard_2.jpg), „Harvey LA back yard 2“, https://creativecommons.org/licenses/by/2.0/legalcode

Photo Credits

Image 154
Fgrammen (https://commons.wikimedia.org/wiki/File:Savannah_Park_with_Fountain.jpg), „Savannah Park with Fountain“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

Image 155
No machine-readable author provided. Rfein1~commonswiki assumed (based on copyright claims). (https://commons.wikimedia.org/wiki/File:Basement-after.jpg), „Basement-after“, marked as public domain, more details on Wikimedia Commons: https://commons.wikimedia.org/wiki/Template:PD-self

Image 156
I, Luc Viatour (https://commons.wikimedia.org/wiki/File:Scatophaga_stercoraria_macro_Luc_Viatour.jpg), „Scatophaga stercoraria macro Luc Viatour“, https://creativecommons.org/licenses/by-sa/3.0/legalcode

REFERENCES

“Carrion.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/carrion. Accessed 16 Feb. 2019.

“Bilateral Symmetry.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/bilateral symmetry. Accessed 16 Feb. 2019.

“Bug.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/bug. Accessed 16 Feb. 2019.

“Caste.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/caste. Accessed 16 Feb. 2019.

“Chela.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/chela. Accessed 16 Feb. 2019.

“Chelicera.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/chelicerae. Accessed 16 Feb. 2019.

“Chitin.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/chitin. Accessed 16 Feb. 2019.

“Clade.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/clade. Accessed 9 March 2019.

“Cursorial.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/cursorial. Accessed 16 Feb. 2019.

“Detritivore.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/detritivores. Accessed 16 Feb. 2019.

“Diurnal.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/diurnal. Accessed 16 Feb. 2019.

“Dung.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/dung. Accessed 16 Feb. 2019.

“Elytron.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/elytra. Accessed 16 Feb. 2019.

“Eusocial.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/eusocial. Accessed 16 Feb. 2019.

Evolution of insects. (2019, January 04). Retrieved from https://en.wikipedia.org/wiki/Evolution_of_insects

“Family.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/family. Accessed 16 Feb. 2019.

Finn, E. M.,Asilidae (Insecta: Diptera: Asilidae). Retrieved from http://entnemdept.ufl.edu/creatures/beneficial/flies/robber_flies.htm

“Larva.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/larva. Accessed 4 March 2019.

Leaf beetle. (2018, December 15). Retrieved from https://en.wikipedia.org/wiki/Leaf_beetle

“Mandible.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/mandibles. Accessed 25 Feb. 2019.

“Membranous.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/membranous. Accessed 25 Feb. 2019.

“Naiad.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/naiads. Accessed 16 Feb. 2019.

REFERENCES

“Nocturnal.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/nocturnal. Accessed 16 Feb. 2019.

Numbers of Insects (Species and Individuals). Smithsonian Institute. Retrieved from https://www.si.edu/spotlight/buginfo/bugnos. Accessed 3 March 2019.

“Nuptial.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/nuptial. Accessed 16 Feb. 2019.

“Order.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/order. Accessed 16 Feb. 2019.

“Parasitoid.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/parasitoids. Accessed 16 Feb. 2019.

“Pollinator.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/pollinators. Accessed 16 Feb. 2019.

“Poikilotherm.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/poikilotherm. Accessed 16 Feb. 2019.

“Predator.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/predators. Accessed 16 Feb. 2019.

“Prothorax.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/prothorax. Accessed 25 Feb. 2019.

“Raptorial.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/raptorial. Accessed 16 Feb. 2019.

“Rostrum.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/rostrum. Accessed 16 Feb. 2019.

“Saltatorial.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/saltatorial. Accessed 25 Feb. 2019.

“Serrate.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/serrate. Accessed 25 Feb. 2019.

“Stridulate.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/stridulation. Accessed 25 Feb. 2019.

“Taxonomy.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/Taxonomy. Accessed 1 March. 2019.

“Thorax.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/thorax. Accessed 25 Feb. 2019.

“Telson.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/telson. Accessed 16 Feb. 2019.

Triplehorn, C. A., Johnson, N. F., & Borror, D. J. (2004). *Borror and DeLongs introduction to the study of insects*. Belmont, CA: Thompson Brooks/Cole.

“Tubercle.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/tubercles. Accessed 25 Feb. 2019.

“Tymbal.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/tymbal. Accessed 16 Feb. 2019.

REFERENCES

Understanding Evolution. 2019. University of California Museum of Paleontology. http://evolution.berkeley.edu/ Accessed 2 March. 2019.

“Vermiform.” Merriam-Webster.com, Merriam-Webster, www.merriam-webster.com/dictionary/vermiform. Accessed 16 Feb. 2019.