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## Scientific Illustrations of Beetles from Maryland and Virginia

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# **Scientific Illustrations of Beetles from Maryland and Virginia**

Sarah Zuehlke

University of Nebraska

Entomology Master's Project

2018

## **Abstract**

This project involves illustrated beetles commonly found in Maryland and Virginia. Scientific illustrations were created using techniques including graphite pencils, scratchboard, pen and ink, and colored pencils. Educational applications for this project include highlights for science lessons. Descriptions, habitat, and diet information were included with each beetle illustration. Collection tips for each species were provided. Illustration technique used were included for each beetle. All illustrations are original hand drawn work.

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## Introduction

Beetles are everywhere. They can be found scurrying across the sidewalk as you stroll for an afternoon or evening walk. Buzzing about porch lights on a warm summer night, beetles provide a lively chorus. Glowing sparks from fireflies paint your backyard with lively light. Beetles crawl throughout your garden and hover across your lawn noisily. These magnificent armored flying fortresses inhabit nearly every habitat in the world. Because of their prevalence beetles provide educators with excellent opportunities to teach natural sciences. Living in rotting logs, they help decompose plant matter which lends to great educational opportunities. The diversity of beetles is amazing. Beetles are wood borers and leaf feeders. They crawl and jump. Some are very hard while others are soft. They come in a spectrum of colors and a variety of shapes and sizes. Many beetles are a joy to see but other are pests of important crops and vegetables making them economically damaging to agriculturalists and farmers. Some make noises, some click, and others have very long antennae. The variety of beetles is nearly endless and provides great opportunities to learn about arthropods and roles of animals in ecosystems. Beetles are thoroughly integrated into habitats and ecosystems across the globe.

Ecosystems have multiple components to them, including both biological and abiotic (or non-living). The interactions are complex and deserve study. In ecosystems organic matter like water, carbon, and nitrogen are cycled through ecosystems in the carbon cycle, while energy on the other hand flows in only one direction and does not cycle through the ecosystem but is turned into forms that cannot be recycled like organic matter (Speight et al. 2008). In the carbon cycle, plants use photosynthesis to convert sun energy into organic growing energy and carbon dioxide, which is let go by respiration, then in turn beetles feed on plants and use those nutrients to grow (Speight et al. 2008). Trophic levels are used to describe the transfer of these materials, with primary consumers like herbivorous beetles feeding directly on plants and secondary consumers such as predators feeding on other insects (Speight et al. 2008). Beetles perform important tasks in the ecosystem, such as being recyclers of waste and organic matter, decomposers, defoliators, predators, and pollinators (Speight et al. 2008). Beetles comprise a large portion of all insects with more varieties than any other order of insects. The more than 300,000 kinds of beetles live in virtually any habitat and ecosystem imaginable (Triplehorn and Johnson 2005). Beetles are herbivores, fungivores, predators, scavengers, omnivores, root feeders, wood borers, miners of leaves, leaf feeders, flower and fruit feeders (Triplehorn and Johnson 2005). With their vast diversity of feeding habits there is a beetle that will eat practically anything. All these roles are important to ecosystems by helping them stay in balance.

This paper examines and illustrates several beetles of the East Coast, many of which have a diversity of roles in the ecosystem. Whether collecting beetles for fun or a science project the sheer diversity of beetles will not disappoint. Beetles represent a rich opportunity for teachers, students, and educators to gain understanding about ecosystems, biological systems, collecting insects, and insect anatomy. This project provides resources for teaching lessons on beetles as

well as instructions for collecting each of the beetles illustrated. The purpose of this project was to scientifically illustrate common beetles of Maryland and Virginia to provide educators, collectors, and students with a valuable resource on these beetles.

Techniques used in this project to create the illustrations were presented in Lana Johnson's Scientific Illustration class of 2016 from the University of Nebraska and *The Guild Handbook of Scientific Illustration*. This project includes scientific illustrations and information on several commonly found beetles as well as descriptions of each beetle, collecting tips, and educational tips. The illustrations presented in this book provide a detailed guide for identification, collection and science education. Included is the distribution or range of each beetle. The beetles used in this project were all collected personally from the years 2015 to 2018 from Maryland and Virginia. Beetles collected from these states represent a wide variety of habitats exhibited throughout the East Coast.

A total of fifteen beetles in various families were scientifically illustrated for this project. Each beetle illustration was drawn by hand and represents original artwork.

## Materials and Methods

The illustration project was carried out as follows. A beetle collected from Maryland or Virginia was selected to be illustrated. Most, if not all, of the beetles found in Maryland are also found in Virginia and in general along the East Coast. Many steps are involved in scientific illustrations. A summary of the techniques used in this project are presented below. All beetles were illustrated using hand drawn techniques. Tools used to create the illustrations included a dissecting microscope with a micrometer equipped lens, photographs with a DSLR camera, various papers, and rulers. A lightbox or window was used to transfer outlines to different paper types.

First, the rough draft outline was created using a microscope, rulers, and photographs. Different parts of the insect were drawn separately, such as legs and antenna. Beetles that were small enough were entirely drawn using the microscope and rulers. Larger specimens were drawn with photographs for the body outline and the microscope for the smaller details and parts such as legs. Once the rough draft outline for each part was done it was transferred to tracing paper then scanned. The rough draft drawings were scanned and resized using Photoshop to make a final outline. All drawn pictures had scale bars so sizing was precise. Once the outline was created it was printed and used to transfer the outline to the final paper type. For the illustrations that were on slightly transparent paper a light box or bright window was used to transfer the outline onto the rendering paper. Strathmore 400 series colored pencil paper was used for the graphite pencil and the colored pencil illustrations. For the pen and ink illustrations either Dura-lar acetate paper or Ampersand clay scratchboard were used. Several techniques were used for the final versions of the illustrations. The beetles were either rendered in colored pencil, pen and ink, scratchboard

with pen and ink, or graphite pencils. Each technique had its own steps for the final version. The scratchboard illustrations were transferred to the scratchboard using a charcoal covered paper between the outline which was drawn on top. Then the outline was traced over using pen and ink. To create the scratchboard illustrations black India ink was painted on using a paint brush and then removed to create details using scratching techniques with a scratching tool. Stippling techniques were also used in the pen and ink illustrations. Conventional Crow Quill pens with Nibs and black India ink and Pigma Micron pens were used for the pen and ink illustrations. Colored pencil illustrations were transferred to the colored pencil paper using a lightbox or window. Graphite pencils were used for creating the outlines. Colored pencil drawings were created using shading and blending with a multitude of different colored pencils. Graphite pencil illustrations were created using different graphite pencils and shading. Tortillons were used for the graphite pencil drawings and the colored pencil drawings to smooth the blending.

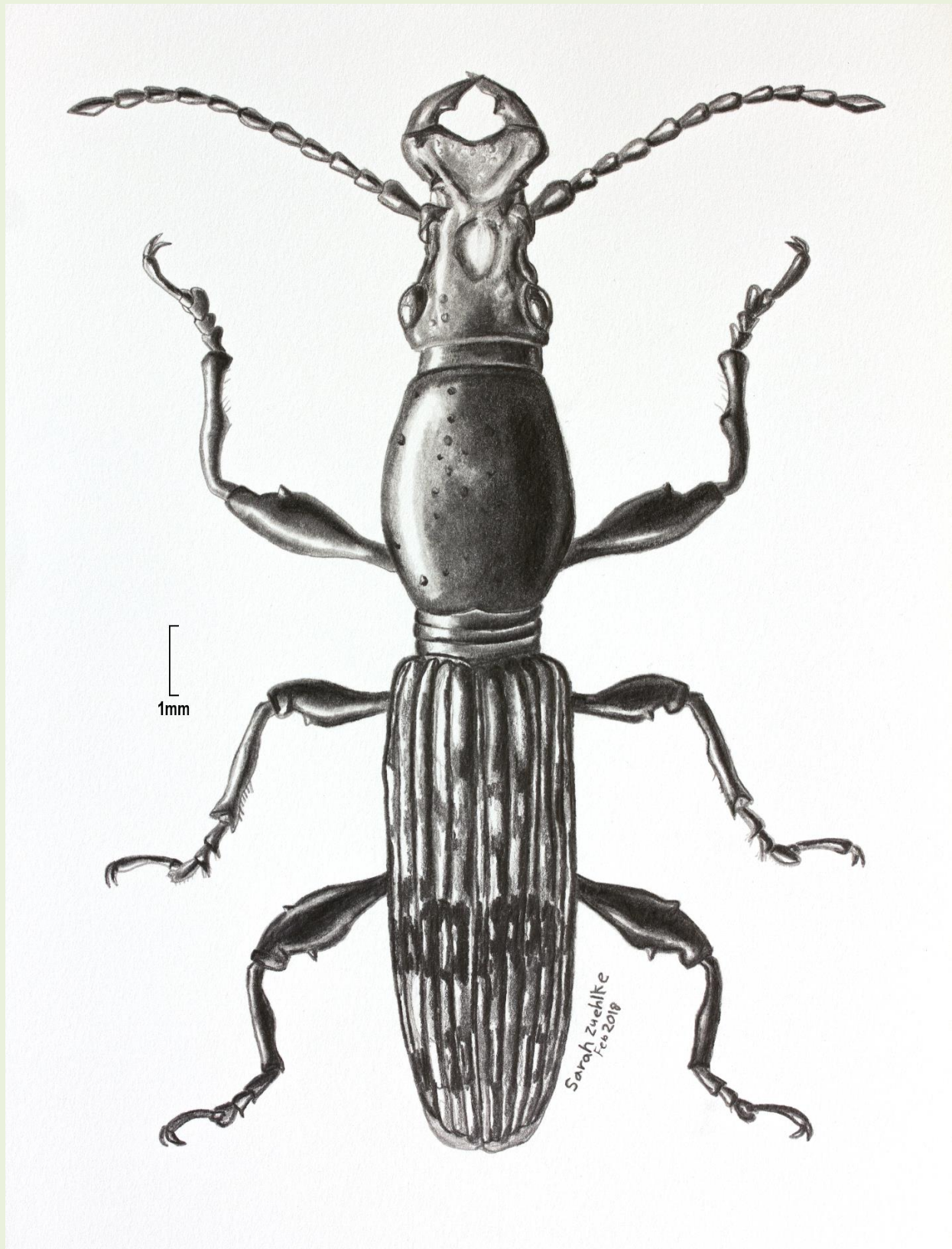
Once final renders were finished the drawings were either scanned or photographed for the project. All beetles were drawn in the dorsal or top view. The scale bars have been redrawn in digital art for clarity. All scale bars are equal to one millimeter (1mm).



## Beetles of Maryland and Virginia Illustrations

Original Artwork and Descriptions

Oak Timberworm – *Arrenodes minutus*



## Oak Timberworm

**Taxonomy:** Family Brentidae, Genus *Arrenodes*, species *minutus*

### Description, habitat, and feeding

The Oak Timberworm is a distinct small beetle with a brownish black or reddish color overall and yellowish markings on the elytra. The Oak Timberworm is an odd-looking beetle with its elongate and nearly tubular shape, which can be from 6-17mm long (Evans 2014). The males and females have differently shaped heads. The females have a long slender snout while the males have a broad head with large mandibles on the end. Their habitat is dying or dead trees where they feed (Evans 2014). They are herbivores feeding on dead trees where they are often found on the bark of the tree (Evans 2014). They can be found in the eastern United States extending to Texas (White 1983). This beetle was found in Maryland, but it is also found in Virginia.

### Collecting tips

The best way to find an Oak Timberworm is to look on dead trees around the bark. They are also attracted to black lights. Just scoop them up with a vial or net to collect them.

### Educational tips

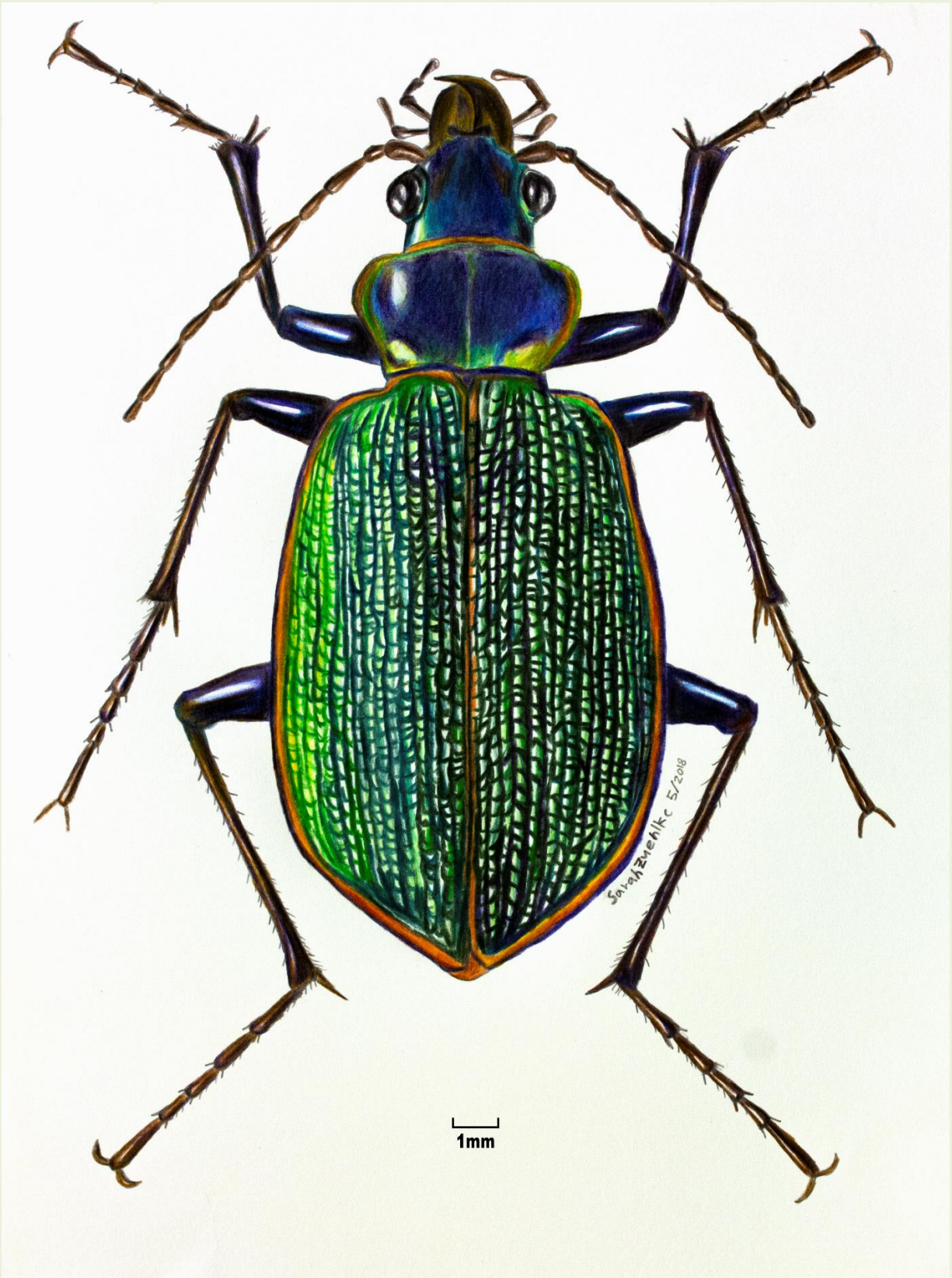
The Oak Timberworm is fascinating because the female has a differently shaped snout than the male. Ask students why they think the beetles have different snout types. For some fun, try and find a male and female and compare the different snout shapes. Finding these beetles can be exciting by checking different logs. Sometimes you can even find quite a few of them on one log. Discuss the shape of this beetle compared to others and how its shape aids in its lifestyle. How can the way they feed help the environment? How does this beetle fit into its habitat? Discuss insect basic body structure and sections to familiarize students with beetle morphology. (Such as the three main body sections namely head, thorax, and abdomen, six legs and their parts, antennae types, eyes, mouthparts, and other morphological and anatomical features).

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper using graphite pencils. Graphite pencils ranging from HB-B6 were used to shade and blend the illustration.



Fiery Searcher – *Calosoma scrutator*



## Fiery Searcher

**Taxonomy:** Family Carabidae, Genus *Calosoma*, species *scrutator*

### Description, habitat, and feeding

The Fiery Searcher is a beautiful beetle with bright shiny metallic coloration with hints of blue, purple, green, and yellowish orange. The elytra (or wing covers, the hard-outer wings of beetles) are bright green with a coppery rim around the edge and the pronotum (area right behind the head) is purple ringed around the edge with green, yellow, and then a coppery color. Their legs are blackish purple. The Fiery Searcher can grow to be from 23 to 36mm long (Evans 2014). The habitat they live in includes gardens, open fields on the edges of woods, near forests, and orchards (Bugguide). The Fiery Searcher is a predator and feeds on caterpillars (Evans 2014). The range of this beetle is quite large and it can be found all over the United States (White 1983). This beetle was collected in Virginia.

### Collecting tips

The Fiery Searcher is a quick beetle that can be found hunting for caterpillars in places like gardens and fields. Put out a black light to try and attract them. Another possibility to find them is to find a bush or plant with caterpillars and search around the area for any beetles especially at night.

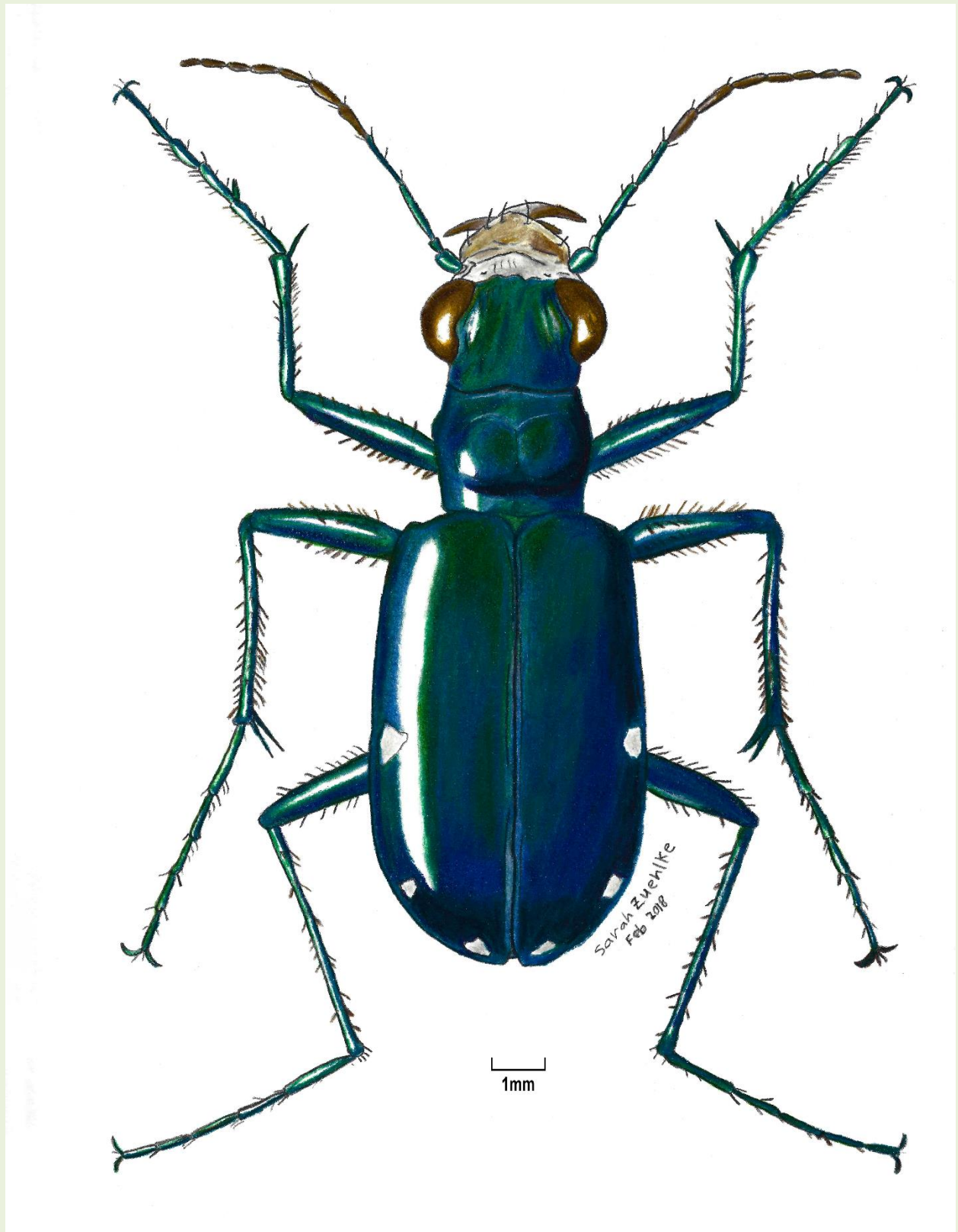
### Educational tips

Fiery Searcher beetles feed on caterpillars. Discuss what benefits this would provide to farmers. Compare the color of this beetle to other beetles and discuss how this coloration might aid in the feeding habits and ecology of the beetle. Compare their morphology and form to beetles in different families. Talk about their feeding habits and how their body shape and jaws might aid in the way they hunt. How are these beetles beneficial to their habitat?

### Illustration technique

This beetle was illustrated with colored pencils on Strathmore 400 series colored pencil paper. Various green, blue, yellow, and purple colored pencils were blended to create the coloration for the elytra with highlights left white.

**Six-spotted Tiger Beetle – *Cicindela sexguttata***



## Six-spotted Tiger Beetle

**Taxonomy:** Family Carabidae, Genus *Cicindela*, species *sexguttata*

### Description, habitat, and feeding

Tiger beetles are very colorful and fast. Like an elusive sparkling gem, they will disappear in a flash. You must be quick to capture these beetles. The Six-spotted Tiger Beetle is a metallic turquoise green and bluish color with a range of other colors mixed in such as dark blue and purple, which can be seen depending on the angle of light. On the wing covers there are six whitish spots that are characteristic of this tiger beetle. The Six-spotted Tiger Beetle is around 10-14mm long (Evans 2014). Tiger beetles live in forests and are usually spotted during spring and summer (Evans 2014). Tiger beetles are predators and eat other insects (Milne and Milne 1997). They have a range that includes most of the eastern United States (Milne and Milne 1997). This beetle was collected in Maryland, but it can also be found in Virginia.

### Collecting tips

The best place to find tiger beetles is on sandy pathways and roads in forests where they can often be seen flying away rapidly as you approach. The only thing you may see is a metallic green gem flying off. They are hard to catch so a net and quick movements are a must. The best way to capture one is to slowly approach and swipe the net down on top of it before it can fly away. Tiger beetles have strong jaws so be careful when handling them.

### Educational tips

For some fun, have students compare the body form and legs of the tiger beetle and another beetle. How do the legs help the tiger beetle move quickly? How does their metallic color fit into their lifestyle? Ask students why they think tiger beetles are so brightly colored. What morphological features of the tiger beetle might aid in its ecological role and lifestyle? How are tiger beetles beneficial to the habitat they live in?

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper with colored pencils. Blue, purple, and green were blended to create the iridescent color of the beetle.



Long Horned Beetle – *Graphisurus fasciatus*





## Long Horned Beetle

**Taxonomy:** Family Cerambycidae, Genus *Graphisurus*, species *fasciatus*

### Description, habitat, and feeding

Long horned beetles are interesting little beetles that have extremely long antennae. In addition to their distinctive antennae they are a gray color with some black markings on their wing covers. They grow to around 9-15mm long (Evans 2014). Long horned beetles live in forests and woods, on dead trees, and flowers (Evans 2014). Long horned beetles are herbivores and feed on a variety of trees tunneling inside them (Evans 2014). The range of this beetle includes most of the eastern United States so they are easy to find (Eaton and Kaufman 2007). This beetle was found in Maryland, but they are also found in Virginia.

### Collecting tips

Long horned beetles can often be found at porch lights or black lights in the summer months. The best way to find them is to turn on porch lights or a black light and check at night to see if any are attracted. Use a net or vial to collect them. They do have strong mandibles so be careful when handling them.

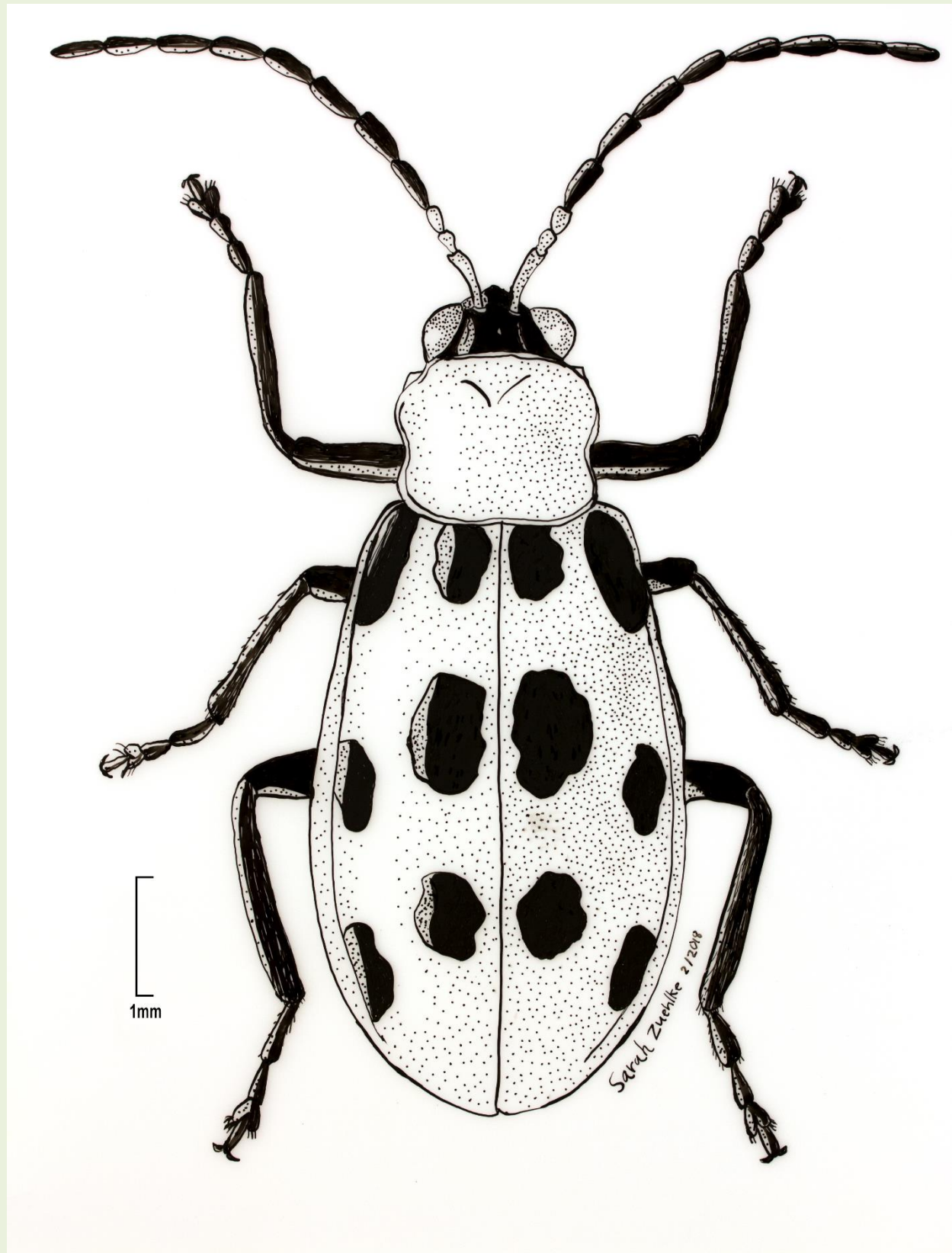
### Educational tips

These beetles make little squeaking noises when you pick them up. Ask students what the purpose of this could be? Have students research how they make the squeaking noise. Other areas of interest to explore include their morphology and how they live inside trees as larvae. What type of trees do long horned beetles like to feed in? Living or dying trees? Discuss how long horned beetles can be pests due to their feeding habits. An example is the Asian Long Horned Beetle that was introduced to the United States in the 1990s and has since caused serious damage to trees including maple and ash (Perry et al. 2016).

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper using graphite pencils. Graphite pencils ranging from HB-B6 were used to blend and shade the illustration. A blending tortillon was used to blend smoothly.

Spotted Cucumber Beetle – *Diabrotica undecimpunctata*



## Spotted Cucumber Beetle

**Taxonomy:** Family Chrysomelidae, Genus *Diabrotica*, species *undecipunctata*

### Description, habitat, and feeding

The Spotted Cucumber Beetle may be charming, but it has a notorious reputation as a pest to crops. Spotted Cucumber Beetles are brightly colored in yellowish green with twelve black spots on their wing covers and a black head. They grow to around 4.6 to 7mm long (Evans 2014). Spotted Cucumber Beetles live in gardens and meadows where they can often be found on various plants, especially flowers (Milne and Milne 1997). They love to sit on flower heads as adults feeding on pollen (Cranshaw 2004). These beetles are herbivores feeding on many types of plants especially cucumber as adults and roots when they are larvae (Evans 2014). Spotted Cucumber Beetles have a large range and live in most areas on the eastern side of the Rocky Mountains (Cranshaw 2004). This beetle was collected in Maryland, but is also found in Virginia.

### Collecting tips

Spotted Cucumber Beetles are easily found on flowers in the summer and fall. Check brightly colored flowers to see if any are feeding on the blossoms or leaves. They do like to crawl under the flower if they are disturbed or fly away so be quick to catch them before they get away. Use a vial or net to collect them.

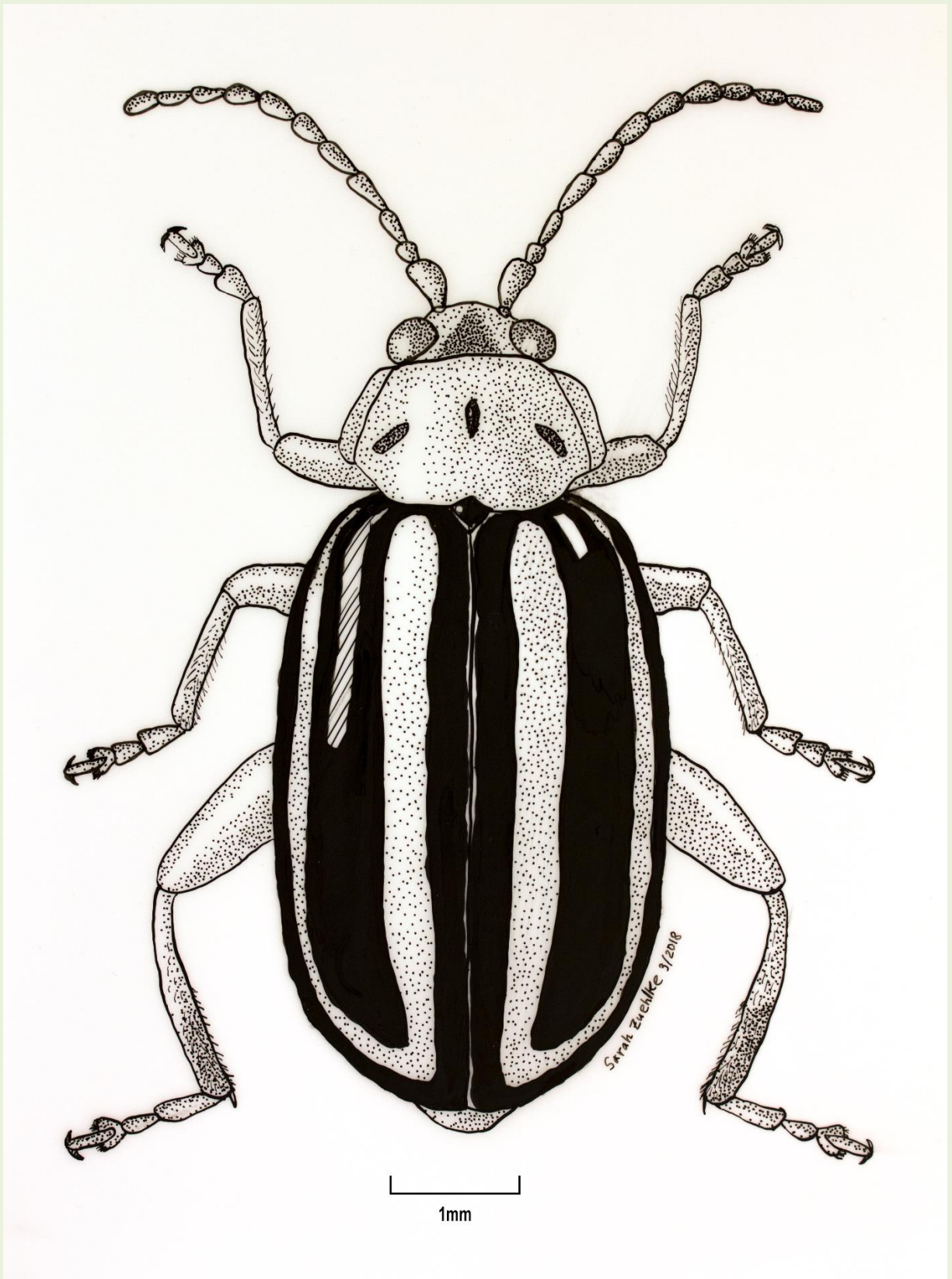
### Educational tips

The Spotted Cucumber Beetle can be used to teach the importance of insect pests to crops. This beetle is considered an important pest meaning it is costly to growers. Though they are small, these beetles are quite damaging to many crops. Research and discuss the damage they cause to plants and how agriculturalists keep them out of their crops. Research what plants these beetles feed on and make a list of the ones that are important. Can they transmit diseases to plants as well? What parts of the plant do they feed on most? Have students draw and color their own Spotted Cucumber Beetles.

### Illustration technique

This beetle was illustrated in pen and ink on Dura-lar matte film paper using stippling techniques. Conventional Crow Quill pen and Nib type pens with black India ink were used to create the illustration along with Pigma Micron pens.

Pigweed Flea Beetle – *Disonycha glabrata*



## Pigweed Flea Beetle

**Taxonomy:** Family Chrysomelidae, Genus *Disonycha*, species *glabrata*

### Description, habitat, and feeding

The Pigweed Flea Beetle is a colorful little beetle. Their back legs are large which allows them to jump like a flea. They have three black stripes on their wing covers with a tannish color between the black (Bugguide). They can be around 5 to 6mm long and have a blackish yellow colored head and their yellow orange pronotum has one to three spots on it (Bugguide). They are herbivores feeding on pigweed plants or *Amaranthus* (Bugguide). Look for them in the summer and fall around weeds (Bugguide). They have a wide range and can be found from the East Coast to the West Coast (Bugguide). This beetle was found in Maryland.

### Collecting tips

To find these beetles look around pigweed plants. They may be slightly hard to find if such plants are not growing nearby. Be quick to scoop the beetles up in a vial or net.

### Educational tips

Compare the body shape and size of this beetle with other beetles and discuss how the form and shape help the beetle live in its habitat. How do their wide back femurs help them jump? Have students draw and color their own beetles. Discuss antennae types and ask students what kind the Pigweed Flea Beetle has. How does this beetle fit into its habitat?

### Illustration technique

This beetle was illustrated on Dura-Lar matte film paper using pen and ink techniques. Shading was done by stippling, using tiny dots, to create shading on the illustration. Black India ink was used to create the black stripes.



**Multicolored Asian Lady Beetle - *Harmonia axyridis***



1mm

## Multicolored Asian Lady Beetle

**Taxonomy:** Family Coccinellidae, Genus *Harmonia*, species *axyridis*

### Description, habitat, and feeding

Lady beetles, or ladybugs, are one of the easiest and most recognizable beetles you can find. They are colorful and live in your backyard and your garden. Ladybugs are oval shaped beetles that are orange or reddish colored with a varying number of black spots on their elytra. Ladybugs grow to around 4.8 to 7.5mm long (Evans 2014). Surprisingly there are many different species of ladybugs. An easy way to know you have the Multicolored Asian Lady Beetle is to look on the pronotum, or head cover, area and spot the black M shape (Evans 2014). Ladybugs live in many different habitats such as flowers, trees, bushes and even inside your house especially in the fall (Evans 2014). Unlike many beetles, ladybugs are predatory as larvae and adults feeding on aphids and mites (Bugguide). Ladybugs live everywhere in the United States (Evans 2014). This beetle was collected in Maryland, but it can also be collected in Virginia.

### Collecting tips

Ladybugs can be found just about anywhere. Try looking on plants and flowers especially areas that have aphids or other small soft insects for them to eat. They come to lights at night so check those areas for possible specimens as well. Ladybugs are easy to handle and can safely be collected by hand or net. Check porch lights and black lights for ladybugs.

### Educational tips

Ladybugs are easy and fun to find. They are friendly and make good teaching aids for learning about beetles or insects in general. You can even buy ladybug eggs and raise them to watch their lifecycle and metamorphosis. Ladybugs come in a variety of colors and shapes. Go out on a collecting trip and see how many different kinds can be found. They are also used as biological controls in gardens which is another topic that can be explored. Ask students why ladybugs are good as biological controls. (A biological control is when a predator or parasitoid is used, like ladybugs feeding on aphids, to help control plant pests naturally). Have students research and discuss insect growth including molting and metamorphosis.

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper using colored pencils. Various orange, yellow, tan, black, white, and red colored pencils were blended to create the colors of the beetle.

Pleasing Fungus Beetle – *Megalodacne fasciata*





## Pleasing Fungus Beetle

**Taxonomy:** Family Erotylidae, Genus *Megalodacne*, species *fasciata*

### Description, habitat, and feeding

The orange markings against deep black make this beetle striking in coloration. They are shiny black with distinct orange markings. Near the rear of the elytra there is a wavy band of orange and toward the front there is a larger band of orange with two black dots on the edges breaking the orange coloring. They can be from 9 to 15.5 mm long (Evans 2014). Pleasing Fungus Beetles live in habitats that have fungus such as on rotten logs and under the bark on dead trees (Evans 2014). Their feeding habits include feeding on the fungus of rotten logs (Evans 2014). Their range is anywhere on the eastern side of the Rocky Mountains (Eaton and Kaufman 2007). They are nocturnal beetles that feed on a type of fungus called bracket fungus (Eaton and Kaufman 2007). Find these beetles in the springtime and into the summer months (Evans 2014). This beetle was collected in Maryland, but it can also be found in Virginia.

### Collecting tips

These beetles are attracted to black lights, especially in areas that are forested with rotten logs. An easy way to find them is to set up a black light near a rotten log to see if any are attracted to the light. Scoop them up in your hand or into a vial to collect them.

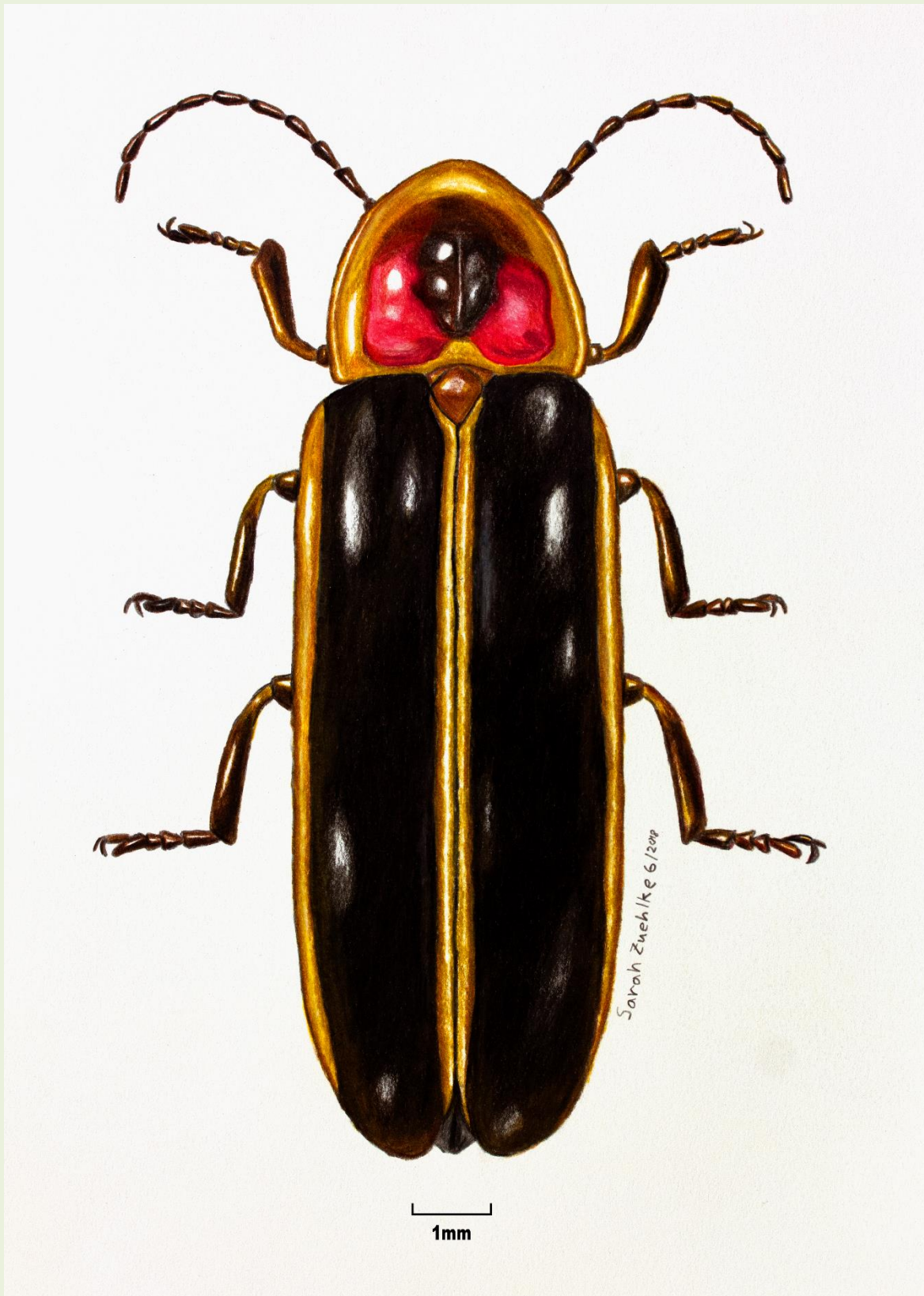
### Educational tips

Fungus beetles feed on fungus on rotting logs and trees. How can this be beneficial to the habitat? Discuss their environmental role as fungus feeders. For some fun, have students draw their own fungus beetles. Put out a black light in a forest to collect some and see how many you can find. You could also check under bark on rotten logs to see if there are any present.

### Illustration technique

This beetle was illustrated on 400 Series Strathmore colored pencil paper using colored pencils. Black, grays, yellows, and browns were blended to create the deep black color. Orange, yellow, ochre, and browns were blended to illustrate the bright orange markings.

**Big Dipper Firefly – *Photinus pyralis***



## Big Dipper Firefly

**Taxonomy:** Family Lampyridae, Genus *Photinus*, species *pyralis*

### Description, habitat, and feeding

Sparks of light dancing in the night, bringing warm summer evenings alive, you cannot have summer without the luminating glow of fireflies dancing in your backyard. Most fireflies have a similar appearance with soft black elytra and the glowing organ on their abdomen. The Big Dipper Firefly has black elytra with tannish edges that go all the way around the elytra. The pronotum has a bright pink or reddish colored area surrounded by tan and in the middle of the pink there is a black patch (Evans 2014). On the underside of their abdomen is the yellow light emitting organs which are pale yellow. The Big Dipper Firefly grows to be around 9 to 15mm long (Evans 2014). The habitat they live in includes yards, gardens, forests, and even parks where you can find them flying around and lighting the dark with their glow at dusk (Evans 2014). Firefly adults do not feed on anything, but when they are larvae they are predatory and feed on slugs and other insect larvae (Bugguide). The Big Dipper Firefly makes a J like pattern as it lights in the evening just before the sun sets (Evans 2014). Their range is along the eastern United States outward to Texas (Evans 2014). This beetle was collected in Maryland, but it is also found in Virginia.

### Collecting tips

Fireflies are fun to collect on summer evenings. All you have to do is go outside and wait until you see a firefly lighting up. Then approach it and scoop it up in your hand or a net. Fireflies can be found in your yard at dusk in the summer so look around then to collect them.

### Educational tips

Fireflies have the unique ability to glow. Research how fireflies create the glow and how the chemical process works. Fireflies have specific lighting patterns so check around for different species by spotting different lighting patterns. Go out on a collecting trip and find fireflies on a summer night. See if you can find different species by watching their patterns of light. Collect a bunch then put them in a jar for some fun. Many firefly females are flightless, and look like worms giving them their popular name of glowworms. Check in the grass around where the males are lighting to see if there are any females around.

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper using colored pencils. Black and gray with some brown were blended to create the dark elytra.

Bess Beetle – *Odontotaenius disjunctus*





## Bess Beetle

**Taxonomy:** Family Passalidae, Genus *Odontotaenius*, species *disjunctus*

### Description, habitat, and feeding

Bess Beetles are large black beetles that are fun to collect. Not only are they large, but they also squeak when picked up. They are shiny black and have a curved horn on their head that sticks out right in the center. They are large beetles growing from 28 to 37mm in length (Evans 2014). Their habitat includes forests and woods where they live in colonies in rotting logs with the adult beetles feeding the young larvae chewed wood (Bugguide). The adults make a squeaking noise and the larvae can squeak as well using their legs (Bugguide). Bess Beetles are herbivores and feed on rotting wood in their colonies (Milne and Milne 1997). They have a range that includes most of the eastern United States (Milne and Milne 1997). This beetle was collected in Maryland, but they can also be found in Virginia.

### Collecting tips

Bess Beetles can easily be found in rotting logs. They also like to come to black lights and porch lights at night. Search for rotting logs, and you are likely to find a colony of Bess Beetles. Pick them up with your hands or use a net to collect them.

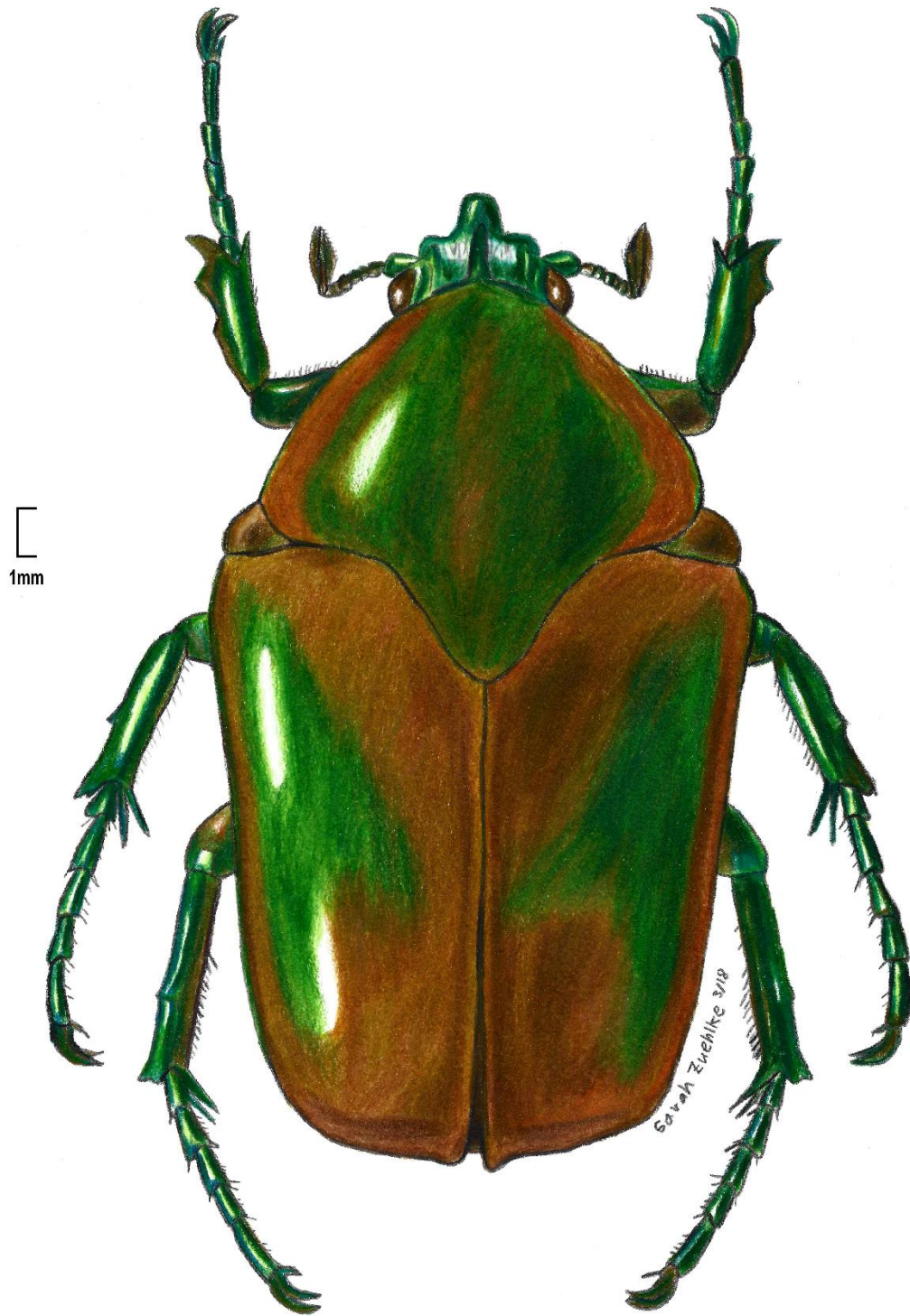
### Educational tips

Bess Beetles are fun to collect and observe. Their large size makes them easy to handle, additionally when touched on the back of their elytra they will make audible squeaks. Have students hold them and determine the reason for the squeaking. Does their squeaking have a purpose in the colony? Research how they make the squeaking noise. Bess Beetles can also be cared for relatively easily. Collect a few and make a terrarium with moist dirt and decayed wood (preferably from where they were found). Place the beetles into their home and watch them crawl around. For more information on Bess Beetle care look online or in books if you plan on keeping them for longer than a few days. Talk about form and shape of the beetles. After students observe the wood in the terrarium being eaten, discuss the role this process has in the forest. What kind of antennae do Bess Beetles have? Have students research different types of beetle antennae.

### Illustration technique

This beetle was illustrated using pen and ink on a 8x10 Ampersand clay scratchboard. Black India ink was painted on with a paintbrush. To create shading and details a scratching tool was used to scratch off the ink.

**Green June Beetle - *Cotinis nitida***



## Green June Beetle

**Taxonomy:** Family Scarabaeidae, Genus *Cotinis*, species *nitida*

### Description, habitat, and feeding

The Green June Beetle is an iconic beetle of the summer. They buzz about your yard and fields noisily. Green June Beetles are dull green and tannish on top but underneath they are shiny metallic green giving them a jewel like appearance. They grow to approximately 15 to 27mm long (Evans 2014). Green June Beetles are herbivores feeding on fruits, leaves, or pollen as adults and feeding on roots as larvae (Milne and Milne 1997). Their habitat includes places with flowers and plants like gardens, fields, and orchards with fruit trees (Milne and Milne 1997). Their range is along the eastern United States extending out to Texas and Nebraska (Bugguide). This beetle was collected in Maryland, but it can also be found in Virginia.

### Collecting tips

Green June Beetles are easy to find on hot summer days flying low over grassy lawns or open fields. They are loud in their flying and clumsy. Use a net to capture them as they get close. These beetles are probably one of the more common beetles to find in the summer. Their color is easy to identify and their large size makes them easy and fun to collect. They might also come to black lights or porch lights.

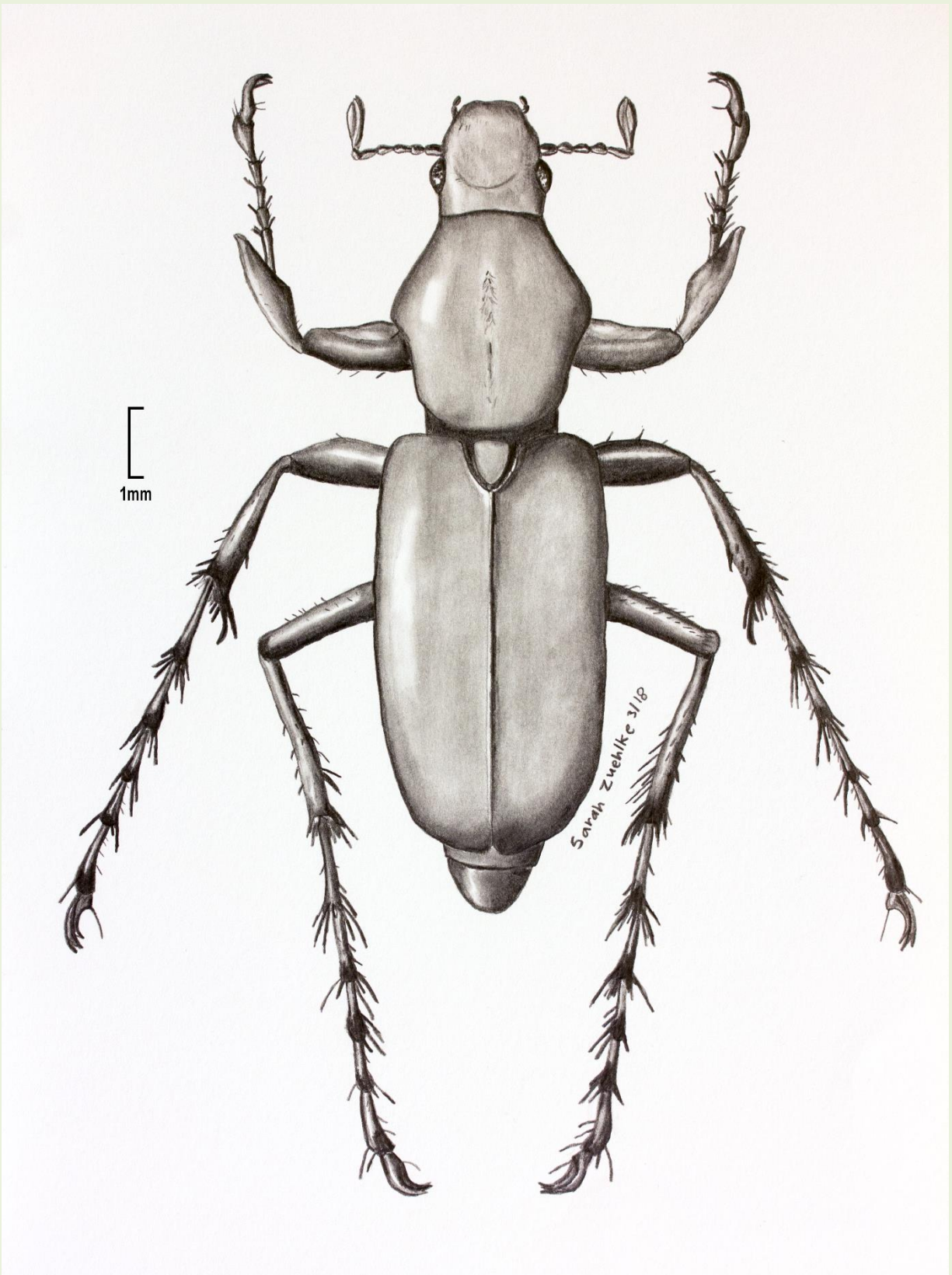
### Educational tips

Green June Beetles have a varying amount of greens and browns on their elytra and pronotum. Some have lots of green and hardly any tan while others have more tan. Have students collect as many as they can and compare colors. What do you suppose the beetles are doing while flying low over the ground? What type of antenna do they have? Discuss form and function of the beetle. After discussing form and function, have students make predictions on beetle morphology. What ecological roles do these beetles perform in their habitat?

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper using colored pencils. A variety of green, tan, and brown colored pencils were blended to create the colors of the beetle.

**Rose Chafer - *Macrodactylus subspinosus***





## Rose Chafer

**Taxonomy:** Family Scarabaeidae, Genus *Macrodactylus*, species *subspinosus*

### Description, habitat, and feeding

Not exactly the most striking beetle, Rose Chafers are a light tannish or yellowish color and have brownish to reddish legs. They can be around 7-10mm long and their legs are quite long with many spines on them (Evans 2014). They live in fields and gardens and can be found on plants (Bugguide). They are herbivores and feed on plants like grapes, roses, birches, cherry trees, and many other plants (Cranshaw 2004). Because they feed on grapevines they can be an important pest of such plants due to their feeding style of skeletonizing the leaves and eating the grapes (Isaacs 2013). Look for them in the early summer months (Bugguide). Their range includes northeastern states (Cranshaw 2004). This beetle was found in Virginia, but is also found in Maryland.

### Collecting tips

The Rose Chafer might be a little harder to find than some of the other beetles. They can be found on plants and bushes like rose bushes. They also might come to lights at night so putting out a light or checking porch lights is a good way to look for them. Collect them with a vial or net.

### Educational tips

These beetles have very long legs with many spines. Ask students why they think they have so many spines. What is a possible purpose for the spines? Spines are even on the underside of the beetle. What possible function could those be for? How is the Rose Chafer economically important? Discuss form and function of the Rose Chafer including its feeding habits and morphology. Research and discuss insect sense organs including spines and eyes.

### Illustration technique

This beetle was illustrated on Strathmore 400 series colored pencil paper using graphite pencils. The shading was done by blending HB-B6 pencils and using a tortillon for smoothness.

Japanese Beetle – *Popilla japonica*



## Japanese Beetle

**Taxonomy:** Family Scarabaeidae, Genus *Popilla*, species *japonica*

### **Description, habitat, and feeding**

Japanese Beetles are distinctive beetles. They stand out among beetles with their bronze colored elytra and shiny green legs and head along with white tufts of hair along their abdomen. They grow to be around 8.9 to 11.8mm long (Evans 2014). Japanese Beetles are rather versatile and live in many habitats that range from gardens, fields, and meadows to trees and woods (Milne and Milne 1997). Anyone with a garden does not want to see these beetles because they feed on flowers and leaves stripping them nearly bare. Japanese Beetles are herbivores and will feed on a variety of flowers, fruits, trees, and even bushes (Milne and Milne 1997). In fact, they can feed on over 300 different kinds of plants, which is quite the host range for just one beetle (Gyeltshen and Hodges 2014). The damage they cause to plants is called skeletonization. The larvae are also pests and feed on grass roots causing considerable damage (Cranshaw 2004). This beetle, which came from Japan in the early 1900s, can congregate in large numbers making it significantly damaging to many plants and lawns (White 1983). The range is along the eastern United States right now but it is expanding to the west (Bugguide). This beetle was collected in Maryland, but they can also be found in Virginia.

### **Collecting tips**

To find Japanese Beetles look around flowers and plants in the early to late summer and even into fall. They can be found practically anywhere plants are because they feed on so many types. Collecting them is easy since they like to feed in large groups. Pick one up with your hands or use a net and place it in a container.

### **Educational tips**

Japanese Beetles are pests of gardens and trees. Discuss the importance of their feeding on the various plants and how this damage can be harmful to the plants. Compare their body shape and morphology to other beetles. Use the beetle to discuss morphology including legs, mouthparts, body sections, and antennae types. Have students draw and color their own Japanese Beetles. Have students discuss and predict impacts this beetle would have to farmers.

### **Illustration technique**

This beetle is illustrated on Strathmore 400 series colored pencil paper with colored pencils. The metallic coloration was created by blending green, blue, purple, and yellow colored pencils.



Roundneck Sexton Beetle – *Nicrophorus orbicollis*



## Roundneck Sexton Beetle

**Taxonomy:** Family Silphidae, Genus *Nicrophorus*, species *orbicollis*

### Description, habitat, and feeding

A sharp contrastingly colored beetle, the Roundneck Sexton Beetle is a shiny black color with short black elytra that do not reach the edge of the abdomen. On the elytra are bright reddish or orangish rounded patterns or splotches. Their antennae are clubbed and the tips are of a yellowish color (Bugguide). They grow to be around 15-22mm long (Evans 2014). The Roundneck Sexton Beetle lives in many habitats such as forests and grassy areas (Bugguide). The Roundneck Sexton Beetle is a carrion beetle. When there is something to clean up you can count on them. Carrion beetles are scavengers that feed on dead and decaying objects like fruit, plant matter, and carrion (Bugguide). The range of this beetle is along the East Coast (Eaton and Kaufman 2007). This beetle was collected in Maryland, but they are also found in Virginia.

### Collecting tips

A good way to find this beetle is to put out a black light. They will often come to the light and climb up on the sheet or be on the ground near the light. Use a net to collect them. You could even use a bait, such as rotten fruits, to attract them. Carrion beetles often have tiny parasitic mites on them. They will not harm you. But you might want to get them off your beetle. To remove them freeze the beetle and then carefully brush them off.

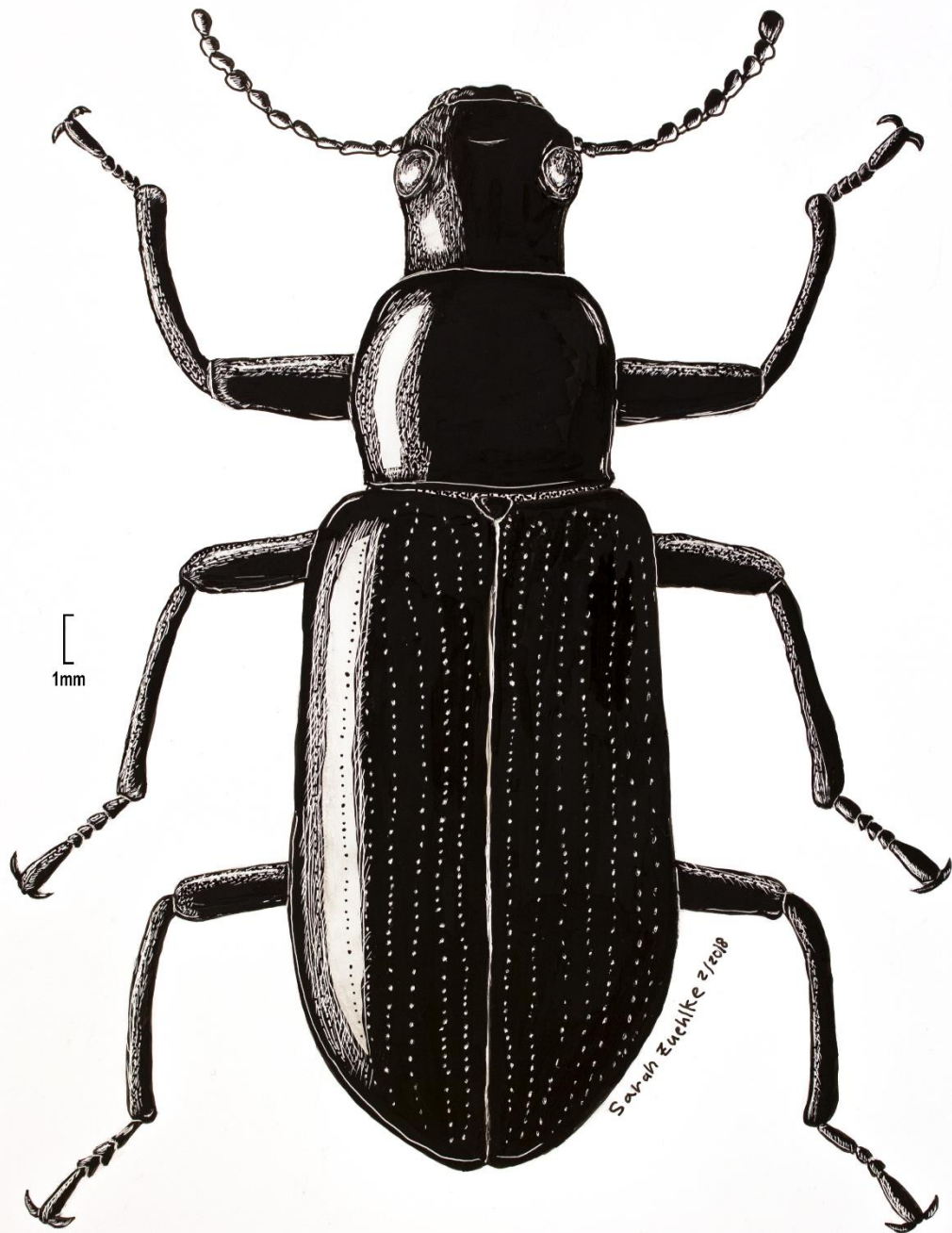
### Educational tips

Discuss and compare how a scavenger is different from a predator. These beetles function as recyclers, how does this help the environment? What ecological role do the beetles fit into? What would happen if there were no carrion beetles? How can carrion beetles impact forest ecology and habitats? If there are tiny brown parasitic mites on the beetle discuss what they might be doing there. What kind of association are the mites exhibiting with the beetle? Set out some bait traps to try and attract different carrion beetles.

### Illustration technique

This beetle is illustrated on Strathmore 400 series colored pencil paper with colored pencils. Black, brown, and gray colored pencils were blended to create the black coloration of the beetle. The orange spots were created by blending orange, yellow, and red colored pencils.

**False Mealworm - *Alobates pensylvanica***





## False Mealworm

**Taxonomy:** Family Tenebrionidae, Genus *Alobates*, species *pensylvanica*

### Description, habitat, and feeding

The False Mealworm, also known as a darkling beetle, is a shiny black beetle. Lacking color but clearly not sleekness, the body, legs, head, and antennae are entirely ebony black. These beetles are large and can be from 20 to 23mm long (Bugguide). Their wing covers have small pits on them in several lines (Evans 2014). Their habitat is under bark on trees that are dead and rotting (Evans 2014). Darkling beetles can be found on logs where fungus is growing (Evans 2014). Looking in and around rotten logs at night will often reveal False Mealworm beetles crawling about. This beetle has a range along the eastern United States (Bugguide). This beetle was collected in Maryland, but they are also found in Virginia.

### Collecting tips

False Mealworm beetles can be found at night crawling around dead trees. Look for rotten logs, especially fungus covered ones, to find False Mealworm beetles. They also like to come to black lights so set one up in a forest and you might get one. The best way to find them is to find a rotting log or stump of a tree with bark still on it. Check around the bark for any beetles.

### Educational tips

For some fun, go out on a night hunt for these beetles. They love to come out at night and sit on the outside of rotten logs. Compare the morphology of this beetle to other beetles. Have students determine what type of antennae they have. Mealworms can be bought at pet stores and raised to observe their biology and metamorphosis. If desired, acquire a few mealworms and raise them. Have students take notes on the number of molts the larvae have. Discuss what type of metamorphosis beetles have. Discuss and research insect development and metamorphosis.

### Illustration technique

This beetle is illustrated on a 9x12 Ampersand clay scratchboard with pen and ink using stippling, scratching, and scraping techniques. Black India ink was painted on using a paintbrush while highlights were left white. Shading and depth were illustrated by scratching out the black India ink with a scratching tool.

## Important Terms List:

**Abiotic:** The non-living parts of an ecosystem like wind, dirt, and rain.

**Biological:** The living parts of an ecosystem, such as animals, plants, fungi, and insects.

**Biological Control:** A predator or parasitoid that is used to control plant pests naturally such as using ladybugs or lacewings to keep aphids under control.

**Carbon cycle:** The cycling of carbon through ecosystems.

**Economically important:** This term is often used in IPM or Integrated Pest Management, a type of insect pest management, and it represents how the pests cause loss of money to agriculturalists due to damaged or destroyed agricultural crops from the pests.

**Elytra or wing covers:** The hard-outer wings of a beetle.

**Herbivore:** A plant feeder which feeds on various parts of plants.

**Larvae:** A young beetle.

**Mandibles:** The jaws of an insect.

**Parasitoid:** A parasitoid is a type of parasite that kills the host it feeds on. Many wasps are parasitoids.

**Predator:** A meat eater which feeds on other insects and creatures.

**Pronotum:** The pronotum is the hard round or squarish shape right behind the head. It could be thought of as a head cover.

**Stippling:** A technique in art where many tiny dots are used to illustrate form.

**Scale Bar:** A scale bar is like a ruler for the insect to determine its size in scientific illustrations.

**Skeletonize or skeletonization:** Feeding on a leaf where only the veins are left causing it to look like a leaf skeleton.

**Tortillon:** A tortillon is a small rolled-up piece of paper artists use to blend or smoothen their drawings. It is a blending tool to help make edges smooth.



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(Bugguide is used as a general reference for any information looked up on Bugguide.Net because it was used on multiple occasions. Each Bugguide reference pertains to the species indicated.)

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