

<p>Who we are: <u>Matt Hamblin</u> mkhamblin@ksu.edu</p> <p>Graduate of Kansas State University in Manhattan, KS.</p> <p>Bachelors of Science in Fisheries, Wildlife and Conservation Biology Minor in Entomology</p> <p>Began M.S. in Entomology Fall 2018 focusing on Entomology Education</p>	
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	<p>Who we are: <u>Jacqueline Maille</u></p> <p>jmaille@ksu.edu</p> <p>Graduate of Kansas State University in Manhattan, KS with M.S. in Entomology.</p> <p>Austin Peay State University in Clarksville, TN with a Bachelors of Science in Biology, Minor Chemistry</p> <p>Began Ph.D. in Entomology with KSU and USDA-SPIERU in Spring 2020 Focusing on Stored Product Pest Sensory Systems and Management</p>
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Who we are:
Isaac Fox
isaac.fox@outlook.com

2016 Kansas 4-H Entomology Award
Winner

Pest Scout at Arnold's Greenhouse




Distribution, Abundance and Diversity

Global distribution

Beetles account for ~25% of all life forms

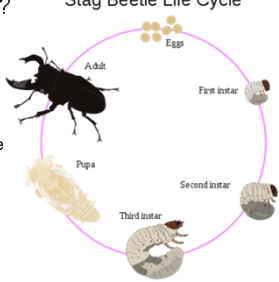
~390,000 species worldwide



What distinguishes a beetle?

1. Hard forewings called elytra
2. Mandibles move horizontally
3. Antennae with usually 11 or less segments exceptions (Cerambycidae Rhipiceridae)
4. Holometabolous

Stag Beetle Life Cycle



Anatomy

Taxonomically Important Features

- Amount of tarsi
- Tarsal spurs/ spines
- Antennae placement and features
- Elytra features
- Eyes
- Body Form

Antennae Forms

- Filiform = thread-like
- Moniliform = beaded
- Serrate = sawtoothed
- Setaceous = bristle-like
- Lamellate = nested plates
- Pectinate = comb-like
- Plumose = long hairs
- Clavate = gradually clubbed
- Capitate = abruptly clubbed
- Aristate = pouch-like with one lateral bristle

Nicrophilus americanus

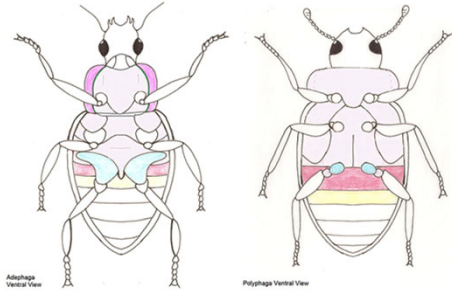
Silphidae, American Burying Beetle

Counties with protected critical habitats:
Montgomery, Elk, Chautauqua, and Wilson

Red-tipped antennae, red pronotum

The ecological services section, Kansas department of Wildlife, Parks, and Tourism

Suborders Adephaga vs Polyphaga



Families

~176 described families in the U.S.


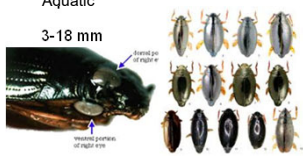
~80 in Kansas.






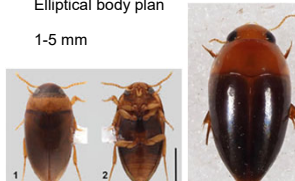
Adephaga

The first abdominal segment is split by the posterior coxa.



<p>Carabidae</p> <p>Setaceous, filiform, moniliform, serrate antennae</p> <p>Variable body form</p> <p>0.7-66 mm</p> 	<p>Gyrinidae</p> <p>Elliptical body plan</p> <p>Eyes are split into dorsal and ventral</p> <p>Aquatic</p> <p>3-18 mm</p> 
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<p>Dytiscidae</p> <p>No ventral spine</p> <p>Elliptical body form</p> <p>Filiform antennae</p> <p>0.7-66 mm</p> 	<p>Hydrophilidae</p> <p>Ventral spine</p> <p>Elliptical body form</p> <p>Short clubbed antennae</p> <p>1.2-40 mm</p> 
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<p>Halipidae</p> <p>Oval and convex, dark patches on elytra</p> <p>Hind coxal plate</p> <p>1.5-5 mm</p> 	<p>Noteridae</p> <p>Distinct platform underneath, in the form of a plate between the second and third pair of legs</p> <p>Elliptical body plan</p> <p>1-5 mm</p> 
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What specimen is **NOT** in the suborder Adephaga?



Polyphaga

The first abdominal segment is **NOT** split by the posterior coxa.



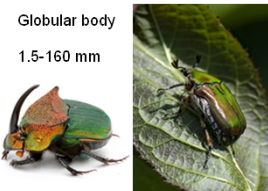
Scarabaeidae

Clubbed antenna with lamella at tips

Front tibia enlarged and toothed

Globular body

1.5-160 mm



Lucanidae



Geniculated lamellated antennae


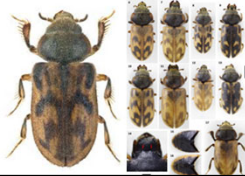
1st antennomere **longer** than next 5



Large mandibles in both sexes



8-60 mm







<h3>Geotrupidae</h3> <p>11 segmented, lamellated antennae</p> <p>Globular body</p> <p>5-45 mm</p> 	<h3>Ochodaeidae</h3> <p>Prominent mandibles, mesotibia with long spur serrate along one edge</p> <p>Globular body</p> <p>4.2-7.5 mm</p> 
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<h3>Hybosoridae</h3> <p>Cupped, lamellate antennae</p> <p>Globular body</p> <p>3-7 mm</p> 	<h3>Heteroceridae</h3> <p>Protruding mandibles, flattened body, & raketlike legs distinctive</p> <p>Cigar-shaped body</p> <p>2-7 mm</p> 
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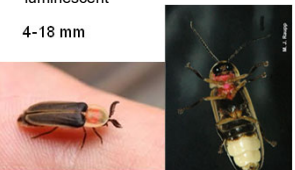
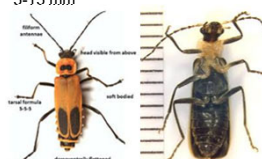
<h3>Trogidae</h3> <p>Lamellated antennae</p> <p>Roughly sculptured, often covered with a crust of soil</p> <p>3-20 mm</p> 	<h3>Histeridae</h3> <p>Head often concealed</p> <p>Oval or flat body plan</p> <p>Elytra short showing 2 abdominal segments from top-view</p> <p>Elytra with striations</p> <p>1-20 mm</p> 
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Leiodidae Oval shaped Small 8th antennomere < 10 mm	Nosodendridae Two species in our area Capitate antennae < 15 mm
	

Nitidulidae Head NOT concealed Variable body plan Elytra short showing 1-3 abdominal segments from top-view Elytra lack striations 0.9-15 mm	Ptinidae Not easily defined group Body plan variable Antennae variable 1-9 mm Usually <5 mm
	


Eroytilidae Elongated-oval Procoxal cavities are closed 2-22 mm	Tetratomidae Tarsal formula 5-5-4, and tarsi not lobed underneath 2-7 mm
	

<p>Coccinellidae</p> <p>Round, elliptical, dome shaped body</p> <p>Tarsi 4-4-4</p> <p>0.8-18 mm</p> 	<p>Chrysomelidae</p> <p>Oval, dome shaped</p> <p>Tarsi 5-5-5</p> <p>1-35 mm</p> 
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<p>Lampyridae</p> <p>Pronotum covers head</p> <p>Eyes large</p> <p>Terminal abdomen segments luminescent</p> <p>4-18 mm</p> 	<p>Cantharidae</p> <p>Pronotum does NOT cover head</p> <p>4th tarsal segment is lobed</p> <p>Luminescence is ABSENT</p> <p>5-15 mm</p> 
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<p>Meloidae</p> <p>Tarsi 5-5-4</p> <p>Filiform or moniliform antennae</p> <p>Prothorax narrower than elytra</p> <p>Tarsal claws clefted</p> <p>3-70 mm</p> 	<p>Oedemeridae</p> <p>Tarsi 5-5-4</p> <p>11 long filiform, serrate or clavate antennomeres</p> <p>Prothorax without margins, expanded anteriorly, then narrowed, sides rounded</p> <p>5-20 mm</p> 
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Cleridae Clubbed antennae Pronotum narrower than elytra Body setose 2-24 mm	Melyridae Serrate antennae Antennae insert in front of head Prominent coxae 2-7 mm
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The image shows two columns of beetle illustrations. The left column, under Cleridae, features a large black and red beetle on the left and a vertical strip of smaller, variously colored beetles on the right. The right column, under Melyridae, shows a large black beetle with a red thorax on the left and a smaller, similar beetle on the right.



Anthicidae Body elongate resembling ants Prominent femurs Large eyes 2-12 mm	Elmidae Long legs with prominent tarsal claws Found only in fast moving waters < 4 mm
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The image shows two columns of beetle illustrations. The left column, under Anthicidae, features a vertical strip of small, dark beetles on the left and a larger, dark beetle with prominent femurs on the right. The right column, under Elmidae, shows a vertical strip of small, dark beetles on the left and a larger, dark beetle with long legs on the right.

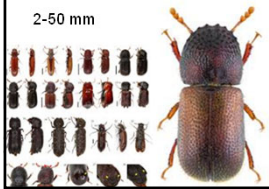

Mordellidae Tarsi 5-5-4 Simple antennae Wedge-shaped body with a humpback Abdomen comes to a point 1.5-15 mm	Ripophoridae Tarsi 5-5-4 Flabellate antennae Wedge-shaped, soft elytra Abdomen comes to a point 3-15 mm
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The image shows two columns of beetle illustrations. The left column, under Mordellidae, features a large, hump-backed beetle on the left and two smaller, dark beetles on the right. The right column, under Ripophoridae, shows a vertical strip of small, dark beetles on the left and a larger, dark beetle with long legs on the right.



Rhiphiceridae Antennae flabellate Nose-like projection between mandibles 11-25 mm 	Phengoididae Antennae branched Short soft elytra Females have luminescent larvae like 15-18 mm 
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Lycidae Antennae serrate Raised reticulated soft elytra 10-15 mm 	Cerambycidae Antennae inserted on a raised area Eyes are notched Tarsi 5-5-5 Setaceous 4-165 mm 
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Buprestidae Antenna never clubbed Bullet-shaped metallic body First two abdominal segments are fused 2-75 mm 	Elateridae Antennae usually serrate Posterior corners of pronotum form sharp points Prosternal spine 0.9-75 mm 
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<h3>Bostrichidae</h3> <p>Pronotum is hoodlike with spines</p> <p>Clubbed antennae</p> <p>Head concealed</p> <p>2-50 mm</p> 	<h3>Dermestidae</h3> <p>Short clubbed antennae</p> <p>Body setose (hairy)</p> <p>Head concealed</p> <p>1-12 mm</p> 
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<h3>Tenebrionidae</h3> <p>Antennae moniliform or clavate below a shelf</p> <p>Body shape highly variable</p> <p>1-80mm</p> 	<h3>Passalidae</h3> <p>Pronotum with medial groove</p> <p>Antennae NOT geniculate (elbowed)</p> <p>1st antennomere shorter than next 4</p> <p>30-40 mm</p> 
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<h3>Silphidae</h3> <p>Elytra are soft</p> <p>Antennae with 11 segments and capitulate</p> <p>7-45 mm</p> 	<h3>Staphylinidae</h3> <p>Elongate slender body</p> <p>Elytra shortened with 3-6 abdominal segments showing in top-view</p> <p>1-35 mm</p> 
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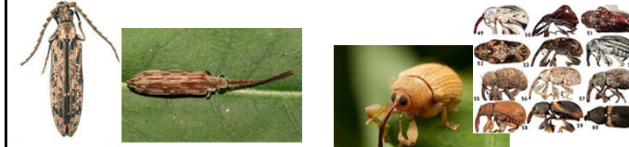
Passandridae Unequal tibia spurs on front legs Grooves on head Compressed body form Prominent mandibles 3-35 mm	Trogossitidae Pronotum wider than head Mandibles typically prominent Highly elongate body 2-22 mm
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Monotomidae Very elongate and parallel-sided 10 segmented antennae with the last 1-2 segments forming a club 1.5-6.0 mm	Cucujidae Flattened elongated body 5 abdominal segments 6-25 mm
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Cupedidae Reticulated elytra Elongated with parallel sided body Broad scale like setae 10-20 mm	Curculionidae Long snout with small mouthparts Geniculate antennae Antennae rising from under eyes 1-40 mm
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Anthribidae Broad flat snout Antennae clubbed and NEVER elbowed 0.4-16 mm		Brentidae Prominent straight snout First two abdominal segments longer than rest Elongate narrow cylindrical 2-80 mm	
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The roles beetles play in our ecosystem...



Questions????



Additional Resources

<https://bugguide.net/node/view/60>

<https://entomology.k-state.edu/extension/4-h-and-youth/Guide-to-Insect-Orders/coleoptera.html>

<http://entnemdept.ufl.edu/choate/beetles1a.pdf>