

# Dissection

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Illustrated by Sabine Deviche and Gustavo Castañeda

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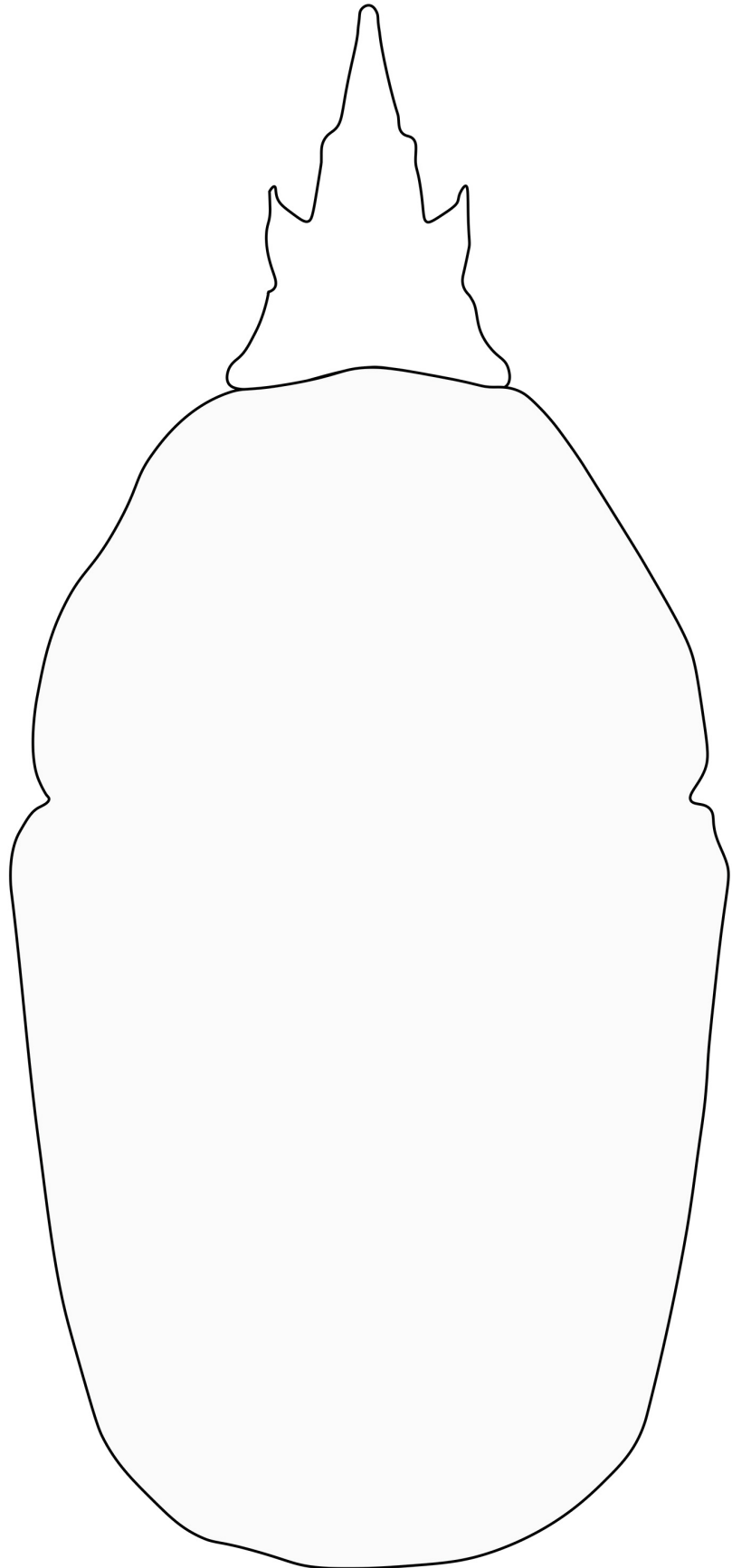
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### About the Authors

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## Build A Beetle

Instructions: All organisms must complete many functions to survive. These functions include movement, digestion, reproduction, respiration (breathing), circulation (fluid movement), filtration (fluid filtering), and sensing the environment. Build a beetle by drawing parts on the beetle that perform all of these functions. Clearly label all parts. On an additional page, describe what each part's function is.



# Beetle Anatomy

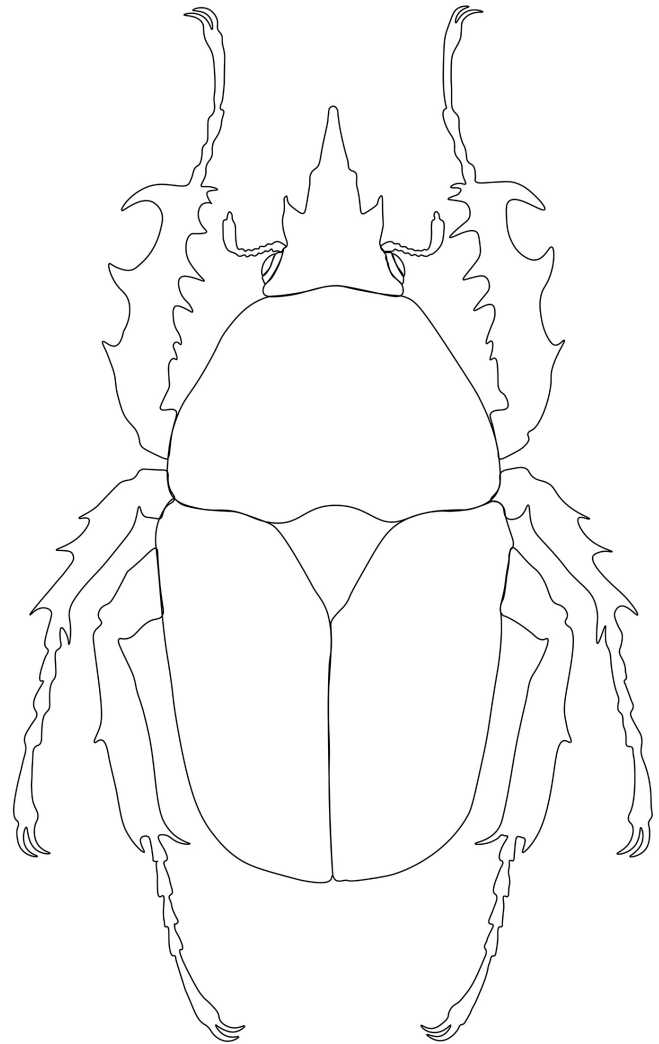
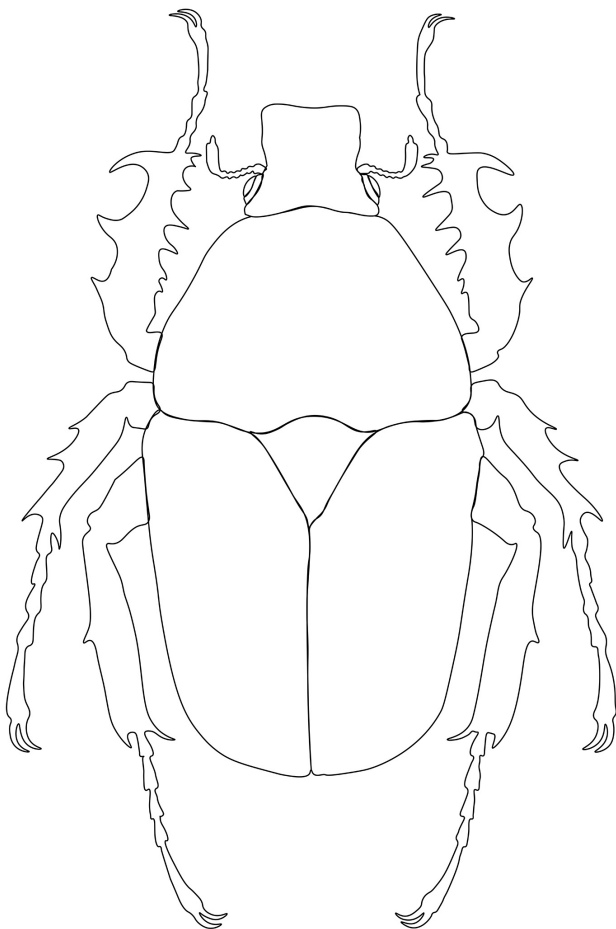
**Instructions:** View the virtual beetle dissection and the beetle x-ray videos. Label the beetle drawings with the parts listed below. All parts will not be found in all drawings.

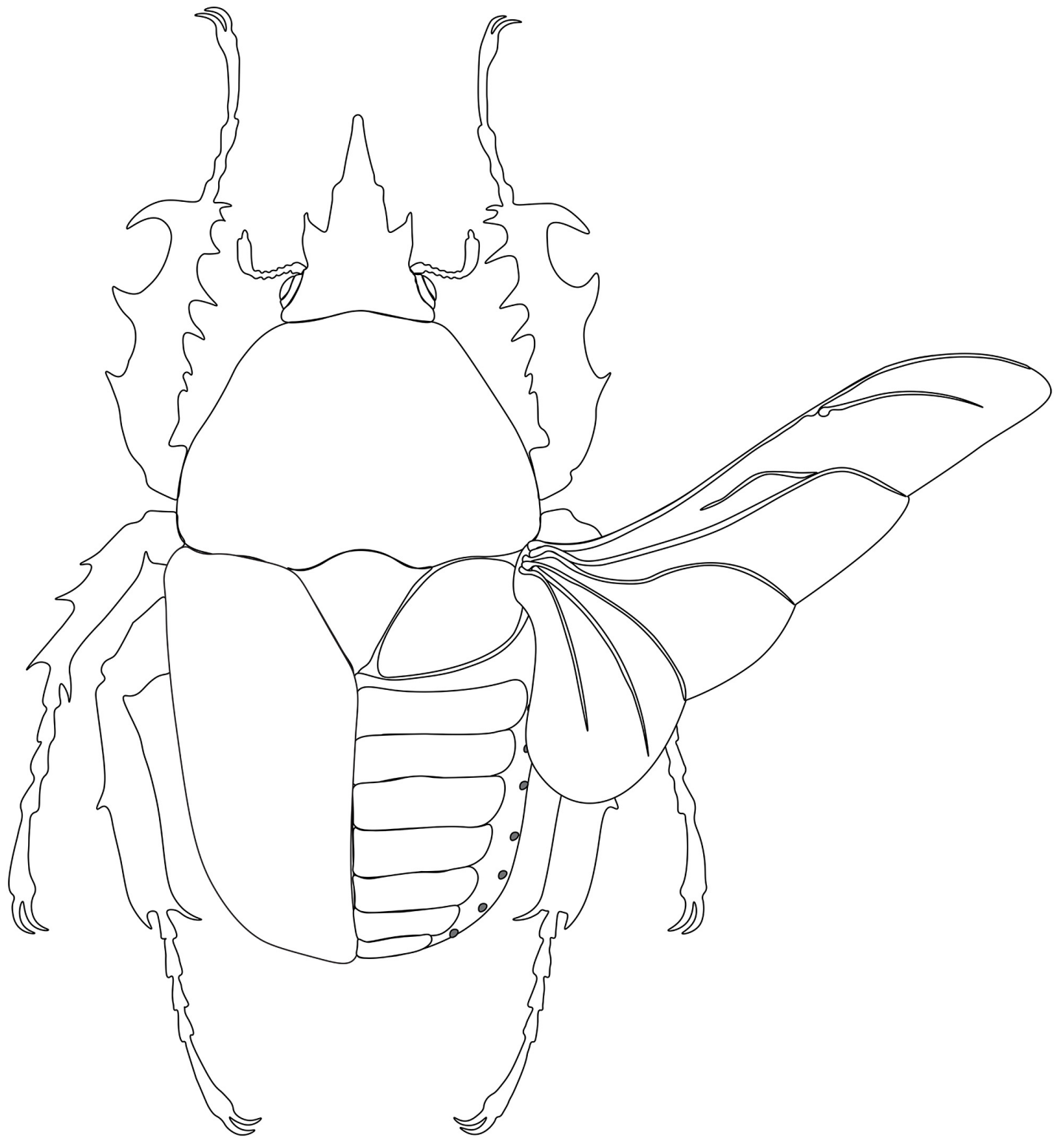
## Beetle parts

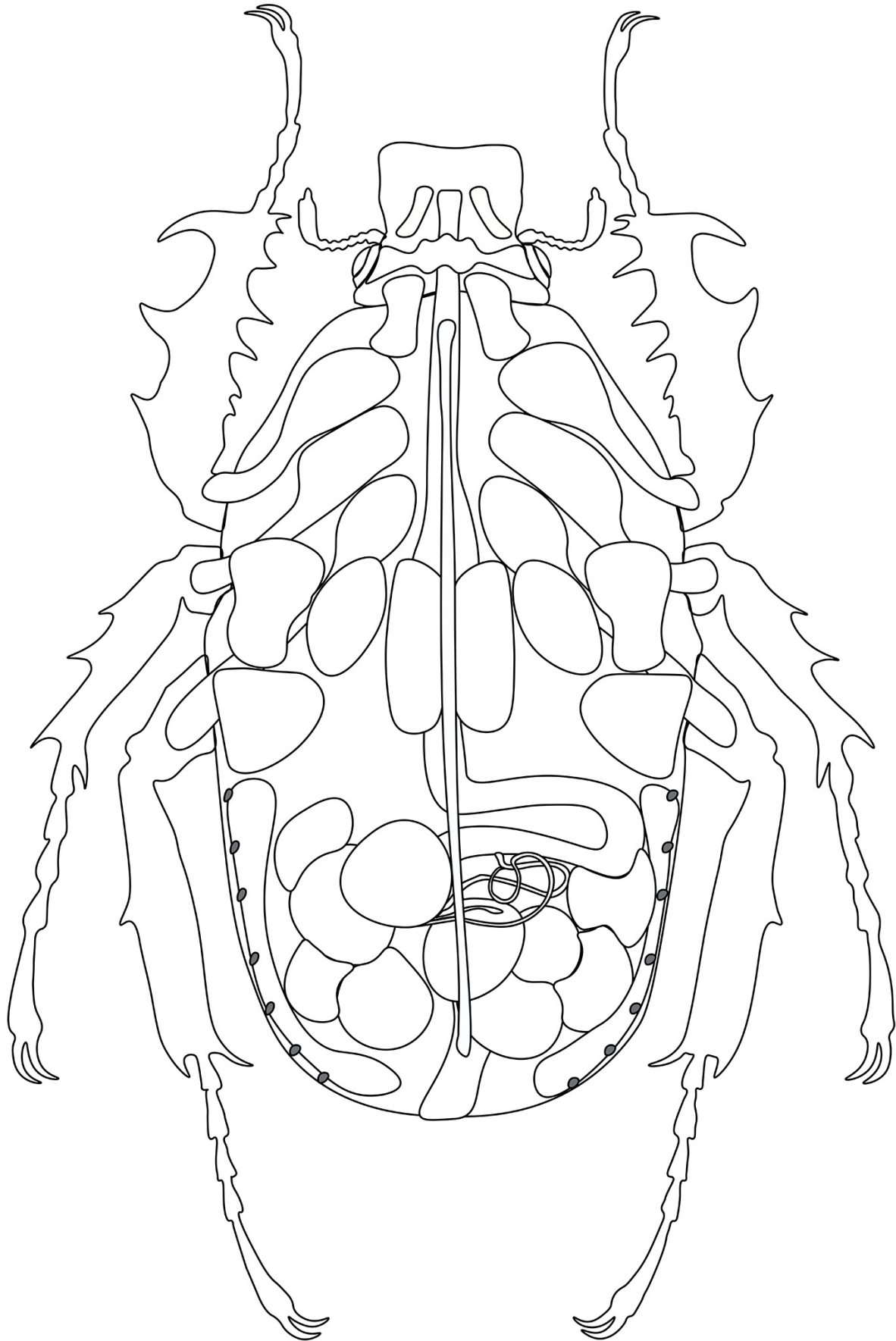
abdomen  
abdominal spiracles  
antennae  
basalar flight muscle  
brain  
compound eyes  
crop  
dorsolongitudinal flight muscle  
dorsoventral flight muscle  
eggs  
elytra  
esophagus  
fat body

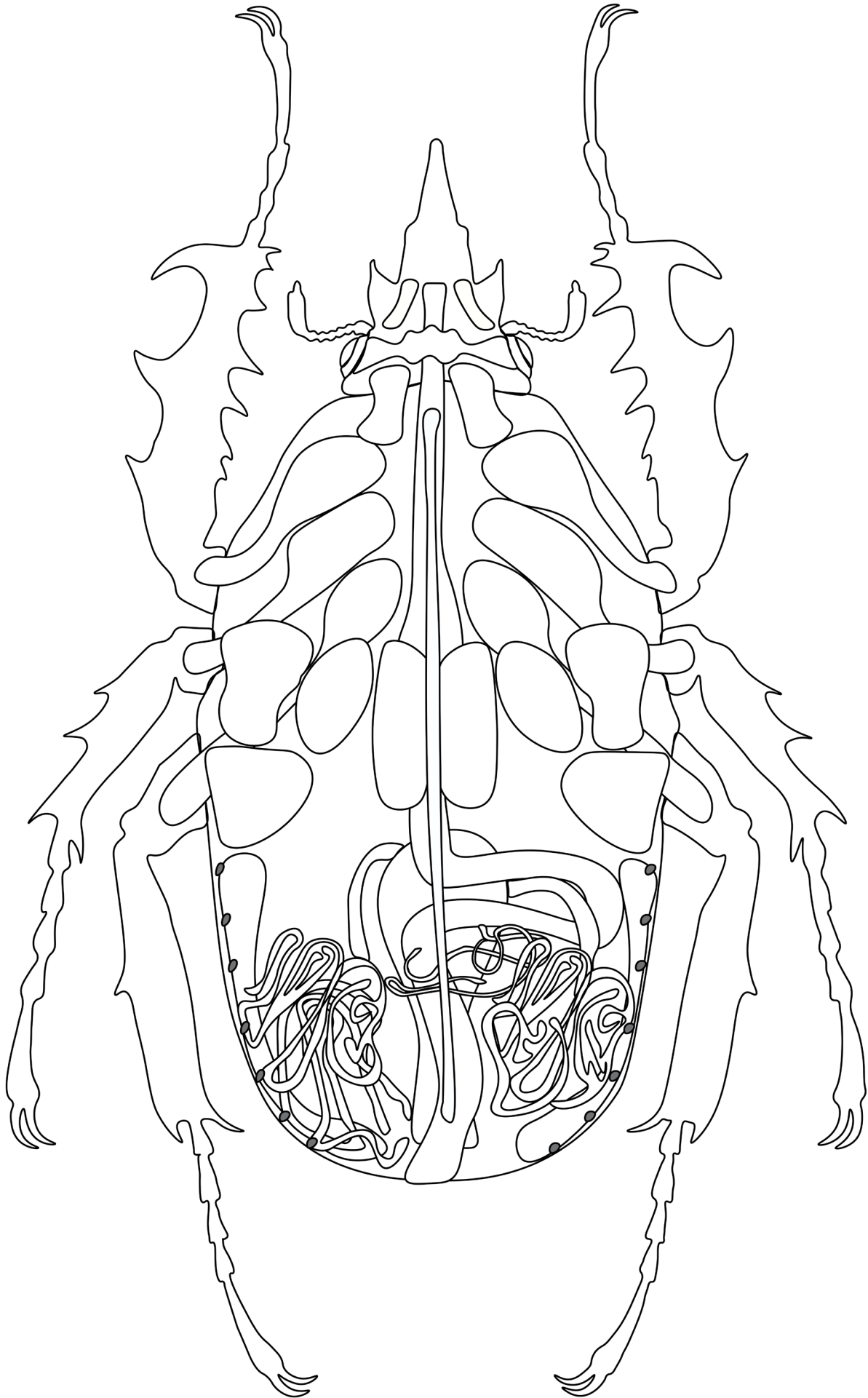
femur  
head  
head muscles  
heart  
horns  
intestine  
Malpighian tubules  
mesothoracic leg  
mesothoracic leg muscle  
metathoracic leg  
metathoracic leg muscle  
neck muscles  
penis

pronotum  
prothoracic leg  
prothoracic leg muscle  
scutellum  
tarsi  
tergosternal flight muscle  
testes  
thorax  
tibia  
wing  
wing veins









# Virtual Beetle Dissection Activity

## Beetle Dissection

Instructions: Open the virtual beetle dissection. Dissect and inspect the male and female *Mecynorrhina torquata* beetles. While exploring, answer the following questions. If an answer is not available in the dissection tool, check the beetle story or the terms list for the information you need.

## Dissection Observations

1. Record your observations of the following tissues and structures using the virtual dissection.
  - a) flight muscles
  - b) leg muscles
  - c) brain
  - d) eyes
  - e) heart
  - f) digestive tract
  - g) testes
  - h) eggs
  - i) penis
  - j) legs
  - k) wings
  - l) elytra
  - m) spiracles
  - n) air sacs
  - o) fat body
2. The form of an organism's parts (what they look and feel like, how they're shaped) often directly determines the function of that part. Choose three of the parts observed above and explain how the form of the body parts relate to their function.

3. Which external structures are different between the male and female beetles? How are they different?
4. Which internal structures are different between the male and female beetles? How are they different?
5. Propose a reason why these internal and external structures are different between males and females.
6. In many animals, females prefer males with certain traits. Might any of the traits you observe on the male beetle be related to female preference?

### **Exoskeletal System**

7. Look at the beetle's elytra and wings. Which parts are used for flying? Which are used for protection?
8. The beetle has hairs in many places on the outside of its body. What are these hairs used for?
9. True or False: The elytra cover the wings, which attach to the abdomen.
10. Where are the soft parts and the hard parts of the beetle's exoskeleton?  
Why do they have both soft and hard parts?

### **Sensory Systems**

11. What are compound eyes?
12. What is a ganglion? How many do beetles have?



13. Examine the beetle brain. What are three main regions of the brain? What do they do? What sensory organs do they receive information from?

## **Respiratory System**

14. What are the parts of the beetle respiratory system?
15. Why are there tracheae and air sacs throughout the flight muscles and leg muscles?
16. How is oxygen transport different in beetles and humans?
17. Propose a reason why these beetles have so many air sacs and why they are different sizes.

## **Muscular System**

18. How do beetles use muscles to move their legs?
19. How do beetles use muscles to move their wings up and down?
20. The dorso-longitudinal muscles do not attach to the wings, yet when the muscles contract, they depress the wings. How does this work?

## Circulatory System

21. Blood is called hemolymph in insects. Do you see any hemolymph in the virtual beetle dissection? Use an outside reference to discuss how insect blood and human blood differ.
22. Some organs are used for many functions. What are the roles of fat body in the beetle body?

## Digestive System

23. Examine the beetle's mouthparts closely. What kind of food might the beetle eat using these mouthparts?
24. Use an outside reference to discuss how the digestive tract of the beetles differs from the human digestive tract.
25. What is the function of Malpighian tubules? What human organ are they most similar to?
26. *Putting it all together:* Choose a body system. Explain how each of its parts work together as a system in the beetle. How and why is this system different in humans? What would happen to the beetle if this system was removed?

# Virtual Beetle Dissection Activity

## Beetle X-ray Videos

Instructions: Open the beetle x-ray video viewer webpage. View the *Dicronorrhina derbyana* beetle x-ray videos. Read the text on the webpage. Answer the following questions while reading and observing the videos.

1. 1. Record observations of the following tissues and structures using the x-ray videos:

- a) flight muscles
- b) leg muscles
- c) brain
- d) eyes
- e) digestive tract
- f) testes
- g) eggs
- h) penis
- i) legs
- j) wings
- k) elytra
- l) spiracles

2. Explain why different types of tissue appear brighter or darker on x-rays.

3. Which structures are easy to see on the x-rays? Why?

4. Which structures are difficult to tell apart on the x-rays? Why?

5. Are there any structures that you could find in the beetle dissection that you can't find in the x-ray videos? Propose a reason why you can't find them.
  
6. Compare the beetle dissection to the beetle x-ray videos. Is dissection or x-ray technology more useful? Explain your answer.
  
7. What are x-rays?
  
8. What are radiographs?
  
9. What is MicroCT? Why is it useful?
  
10. Besides viewing beetle body parts, what are x-rays used for?
  
11. *Putting it all together:* Some body parts are difficult to see using x-ray. Propose a way that would allow you to observe more body parts using x-ray. Use additional resources if needed.

## Build A Beetle: Post-Dissection Activity

**Instructions:** Refer to your “Build A Beetle: Pre-Dissection Activity” beetle drawing. With your new knowledge of beetle anatomy, answer the following questions.

1. What parts did you add to your beetle drawing that the beetle dissection did not have? Why did you add them?
2. Did you think the parts you mentioned in question 1 were important? Do other parts of the beetle perform the functions these parts would have performed? If yes, how?
3. What parts did you leave out of your beetle drawing that were in the beetle dissection?
4. Why are these parts important for the beetle to function?
5. You probably drew many of the same parts that you saw in the beetle dissection. Pick one that looks different than you expected. What did you expect this part to look like? How does the appearance of this part in the beetle dissection relate to its function in the beetle?