

## Photo Description



A green grasshopper sits on a hibiscus flower bud, using its strong jaws to eat the dark red petals inside. The grasshopper's powerful hind legs and long antennae are clearly visible as it feeds on the plant material. This shows a direct example of an herbivore consuming plant parts for energy and nutrients.

## Scientific Phenomena

The anchoring phenomenon here is herbivory - the feeding relationship between plant-eating animals and their food sources. The grasshopper is demonstrating how primary consumers obtain energy by breaking down plant tissues with specialized mouthparts. This occurs because grasshoppers have evolved mandibles (jaws) specifically designed to cut and chew plant material, allowing them to access the stored chemical energy in plant cells through cellular respiration after digestion.

## Core Science Concepts

1. Energy Flow in Ecosystems: The grasshopper represents a primary consumer transferring energy from producers (plants) to higher trophic levels through feeding relationships.
2. Structural Adaptations: The grasshopper's mandibles, compound eyes, and powerful legs are specialized structures that help it successfully locate, capture, and consume plant food sources.
3. Interdependence in Nature: This feeding relationship demonstrates how organisms depend on each other - the grasshopper needs plants for energy, while its feeding may actually help some plants through seed dispersal.
4. Matter and Energy Transfer: The grasshopper breaks down complex plant molecules into simpler compounds its body can use for growth, movement, and life processes.

### Pedagogical Tip:

Use the "Think-Pair-Share" strategy when introducing this image. Have students first observe silently, then discuss with a partner what they notice, before sharing observations with the whole class. This builds observation skills and scientific vocabulary.

### UDL Suggestions:

Provide multiple ways for students to express their understanding: allow them to draw food webs, act out predator-prey relationships, or create digital presentations about herbivore adaptations to accommodate different learning preferences.

### Zoom In / Zoom Out

1. Zoom In: At the cellular level, the grasshopper's digestive enzymes are breaking down cellulose and other complex carbohydrates in the plant cells into simple sugars. These molecules then undergo cellular respiration in the grasshopper's cells to release ATP energy for life processes.
2. Zoom Out: This feeding interaction is part of a larger food web where grasshoppers serve as prey for birds, spiders, and other predators. The grasshopper's population affects plant communities, while predator populations control grasshopper numbers, maintaining ecosystem balance.

### Discussion Questions

1. How might the grasshopper's feeding behavior change if this hibiscus plant was the only food source available in its habitat? (Bloom's: Analyze | DOK: 3)
2. What adaptations does the grasshopper have that make it successful at eating plants, and how do these compare to adaptations of carnivorous insects? (Bloom's: Compare | DOK: 2)
3. If grasshopper populations suddenly increased dramatically in an ecosystem, what effects might this have on both plant and animal communities? (Bloom's: Evaluate | DOK: 3)
4. What evidence from the photograph supports the idea that energy flows from producers to consumers in food chains? (Bloom's: Apply | DOK: 2)

### Potential Student Misconceptions

1. Misconception: "All insects are harmful to plants and should be eliminated."  
Scientific Clarification: Many insects, including some grasshoppers, play important roles in ecosystems through pollination, decomposition, and serving as food for other animals.
2. Misconception: "Grasshoppers only eat grass because of their name."  
Scientific Clarification: Grasshoppers are generalist herbivores that eat many types of plants including flowers, leaves, stems, and seeds from various plant species.
3. Misconception: "The grasshopper is hurting the plant on purpose."  
Scientific Clarification: The grasshopper is simply obtaining necessary nutrients for survival - this is a natural feeding relationship that has existed for millions of years.

### Cross-Curricular Ideas

1. Math - Data Collection & Graphing: Have students conduct a classroom survey about which plants in a school garden are eaten by insects. Create bar graphs or pie charts showing the results. Students can calculate percentages of plants that show herbivore damage versus those that don't, practicing data analysis skills while connecting to the science concept.
2. ELA - Nature Journaling & Descriptive Writing: Ask students to write detailed observations about the grasshopper and hibiscus from the photo, using sensory language and scientific vocabulary. They can create "field journal entries" from the perspective of either the grasshopper or the plant, developing creative writing skills while reinforcing science understanding through narrative.

3. Art - Insect Illustration & Anatomy Drawing: Students can create detailed, labeled drawings of the grasshopper showing its key adaptations (mandibles, legs, antennae, eyes). This combines art with scientific illustration techniques, helping students understand structure-function relationships through visual representation and careful observation.

4. Social Studies - Agricultural Impact: Discuss how grasshoppers affect farmers and food production around the world. Students can research how different cultures and countries manage grasshopper populations to protect crops, connecting local ecosystems to global food systems and human communities.

### STEM Career Connection

1. Entomologist (Insect Scientist): An entomologist studies insects like grasshoppers to understand how they live, what they eat, and how they affect plants and ecosystems. Some entomologists work to help farmers protect their crops from damaging insects, while others study insects to understand nature better. They might use microscopes, conduct field observations, and write reports about their discoveries. Average Annual Salary: \$63,000 - \$75,000

2. Agricultural Scientist: An agricultural scientist works with farmers to help grow healthy crops and manage pest populations, including grasshoppers that eat plants. They research ways to protect plants from insects without harming the environment, and they test new farming methods to increase food production. This job combines biology, chemistry, and problem-solving skills. Average Annual Salary: \$68,000 - \$82,000

3. Ecologist: An ecologist studies how organisms like grasshoppers interact with plants and other animals in their habitats. They work to protect ecosystems and understand food webs, energy flow, and biodiversity. Ecologists might work in forests, grasslands, or wetlands, observing animals and plants to learn how nature stays balanced. Average Annual Salary: \$65,000 - \$78,000

### NGSS Connections

- Performance Expectation: 5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
- Disciplinary Core Ideas: 5-LS2.A - The food of almost any kind of animal can be traced back to plants
- Disciplinary Core Ideas: 5-LS1.C - Food provides animals with the materials they need for body repair and growth
- Crosscutting Concepts: Systems and System Models - A system can be described in terms of its components and their interactions
- Crosscutting Concepts: Energy and Matter - Matter is transported into, out of, and within systems

### Science Vocabulary

- \* Herbivore: An animal that eats only plants for food and energy.
- \* Primary Consumer: The first level of animals in a food chain that eat producers (plants).
- \* Mandibles: The strong, jaw-like mouthparts that insects use to bite and chew food.
- \* Adaptation: A special feature that helps an organism survive in its environment.
- \* Trophic Level: The position an organism occupies in a food chain based on what it eats.
- \* Interdependence: How living things depend on each other for survival in an ecosystem.

### External Resources

Children's Books:

- Who Eats What? Food Chains and Food Webs by Patricia Lauber
- What Is a Food Chain? by Bobbie Kalman



## Grasshopper Eating Hibiscus Bud — 5th Grade Lesson Guide

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- Grasshoppers by Gail Gibbons