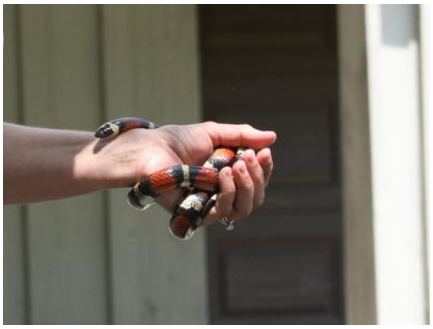
King Snake

Life Science | Lesson Guide

5th Grade

Photo Description



This image shows a coral snake (or coral snake mimic) being safely held in a person's hand. The snake has distinctive red, yellow, and black bands running around its body. The bright coloring is a warning signal that tells predators the snake may be dangerous, which is an important survival adaptation in nature.

Scientific Phenomena

Anchoring Phenomenon: Warning Coloration (Aposematism)

This snake displays bright, contrasting colors in a specific banding pattern. This is happening because the snake (or its mimic) uses color as a defense strategy. Over many generations, snakes with these warning colors survived better because predators learned to avoid them. The predators that ate brightly-colored snakes and got sick or poisoned didn't survive to eat more snakes. This process, called natural selection, shaped both the snake's appearance and predator behavior. The bright colors are like nature's "warning label"—they communicate danger without the snake having to fight or run away.

Core Science Concepts

1. Adaptations for Survival
   - Physical traits (like bright colors) help animals survive in their environment
   - These traits develop over many generations through natural selection

2. Animal Behavior and Communication
   - Animals use visual signals (colors, patterns) to communicate with other animals
   - Warning coloration is a behavior strategy that protects the animal without physical combat

3. Predator-Prey Relationships
   - Predators learn which prey are safe or dangerous to eat
   - Prey animals develop defense strategies to survive predator attacks

4. Mimicry in Nature
   - Some harmless animals copy the appearance of dangerous animals
   - This "false warning" also protects harmless snakes from being eaten

> **Pedagogical Tip:**
>
> Consider starting this lesson by asking students to observe the snake's colors WITHOUT revealing what it is. Ask: "What do these colors tell you about this animal?" This builds observational skills and prediction before introducing the scientific explanation. Students are more engaged when they discover the "why" themselves.

UDL Suggestions:

Representation: Provide both images and videos of snakes with warning coloration, plus diagrams showing predator avoidance. Some students may have ophidiophobia (fear of snakes), so emphasize safety and allow them to engage with digital images rather than live animals.

Action/Expression: Allow students to choose how they demonstrate understanding—creating a colored diagram of warning coloration, writing a predator's "field guide" to dangerous snakes, or recording a short video explanation. This honors multiple learning modalities.

Engagement: Connect to students' real lives by discussing how warning colors appear in everyday items (yellow/black on bees, caution tape, traffic signs). This makes abstract adaptation concepts concrete.

Zoom In / Zoom Out

Zoom In: The Cellular Level

When a predator sees the snake's bright red, yellow, and black colors, light bounces off the snake's skin and enters the predator's eyes. Inside the predator's eye, special cells called photoreceptors detect different colors of light. These cells send messages to the brain that say "bright colors = danger!" This learning happens in the brain's cells through a process called neural pathways—basically, the predator's brain cells create stronger connections between "bright colors" and "bad experience," so the predator remembers to avoid those colors next time. Over many generations, snakes with genes that produce brighter pigments (colored chemicals) in their skin survived better because predators learned faster to avoid them.

Zoom Out: The Ecosystem Level

A single bright-colored snake is part of a much larger ecosystem where many predators and many prey species interact. The snake's warning colors affect which predators hunt in that area—some predators learn and move elsewhere, while others stay and risk getting poisoned. This changes the predator community. When fewer predators eat snakes, the snake population might grow larger, which means snakes eat more frogs, insects, or small mammals. Those prey populations shrink, affecting birds and larger predators that eat them too. The bright coloring of one snake species ripples through the entire food web, influencing which animals thrive and which struggle in that ecosystem. This is why ecologists study how adaptations like warning colors shape entire communities, not just individual animals.

Discussion Questions

1. Why do you think this snake's bright colors might help it survive? (Bloom's: Analyze | DOK: 2)

2. If a predator eats a poisonous snake and gets sick, how might that affect what it hunts in the future? (Bloom's: Evaluate | DOK: 3)

3. Some harmless snakes look almost identical to poisonous snakes. How could this be helpful to the harmless snake? (Bloom's: Apply | DOK: 2)

4. Over thousands of years, why might snakes with brighter warning colors become more common in a population than snakes with dull colors? (Bloom's: Synthesize | DOK: 3)

Potential Student Misconceptions

Misconception 1: "The snake's colors changed because it wanted to scare predators."

Clarification: The snake didn't choose or decide to be bright colors on purpose. Over thousands of years, snakes that happened to be born with brighter colors were more likely to survive (because predators avoided them) and have babies. Those babies also inherited the bright colors. Snakes with dull colors got eaten more often, so they didn't have as many babies. This is why bright colors became common—not because snakes wanted them, but because natural selection favored them. The snake doesn't "know" its colors are a warning; it's just that the colors keep it safe.

Misconception 2: "All snakes with red, yellow, and black stripes are poisonous."
Clarification: Not all brightly-colored snakes are actually poisonous or venomous! Some harmless snakes copy the appearance of dangerous snakes (this is called mimicry). Even if a snake looks dangerous, it might be completely safe to touch. This is why we should never pick up a wild snake without an expert—we can't always tell if it's truly dangerous just by looking. The bright colors are a signal, but the signal can be real OR fake!

Misconception 3: "Warning colors only work if predators see them."
Clarification: Warning colors work because predators learn from experience. A predator might eat a brightly-colored snake once and get sick. That experience teaches the predator to avoid bright colors in the future. So the first snake might not survive, but its bright colors helped other snakes in its family survive because the predator learned the warning signal. Over many generations, more and more predators learn the signal, so bright-colored snakes are safer. It's a system that works across an entire population, not just one individual.

Extension Activities

1. Design Your Own Warning Coloration
   - Students create their own imaginary animal and design warning colors using markers, colored paper, or digital tools
   - Have them write a "field guide" entry explaining why their colors would scare predators
   - Display as a class gallery with predictions about which designs would work best

2. Predator Learning Simulation
   - Create a game where students are "predators" learning to avoid brightly-colored prey
   - Use colored paper cutouts of "safe" (dull-colored) and "dangerous" (bright-colored) prey
   - Track how long it takes predators to learn which colors mean "don't eat me!"
   - Discuss: How might this help us understand why warning colors evolved?

3. Snake Adaptation Research Project
   - In pairs or small groups, have students research different snake adaptations (camouflage, fangs, speed, mimicry)
   - Create a comparison poster or digital presentation showing how different snakes survive using different strategies
   - Present findings to the class and vote on which adaptation seems most effective

Cross-Curricular Ideas

Math: Data Analysis & Patterns
Students can collect data by conducting a predator-learning simulation (see Extension Activity #2). Record how many trials it takes for student "predators" to correctly identify dangerous vs. safe "prey" based on color patterns. Create bar graphs or line graphs showing learning curves. Discuss: Do predators with more experience learn faster? Can you predict how many trials 10 new predators would need? This connects probability, graphing, and pattern recognition to adaptation.

ELA: Persuasive Writing & Informational Text

Have students write from the perspective of either a predator or a prey animal. Predators might write a "survival guide" explaining which animals to hunt and which to avoid. Prey animals might write a "defense manual" explaining their warning colors. Alternatively, students can research and write an informational paragraph about a real snake species, explaining its adaptations and whether it's safe to encounter. This builds vocabulary, evidence-based writing, and research skills while deepening science understanding.

Art: Design & Visual Communication
Students design their own animal with warning coloration, creating colored drawings or digital art. Discuss color psychology: Which color combinations seem most "warning-like"? Why do you think nature chose red, yellow, and black? Have students explore how warning colors appear in human culture (caution tape, traffic signs, safety equipment). Create a classroom display comparing nature's warning colors to human-made warning signals, discussing how both systems communicate danger without words.

Social Studies: Animal Behavior & Cultural Perspectives
Connect to how different cultures view snakes and colors. In some cultures, bright colors mean luck or celebration; in others, they mean danger. Have students research how people in different regions respond to snakes and why those responses might have developed based on local snake species. Discuss how understanding animal adaptations helps humans make better decisions about wildlife conservation and safe coexistence with animals in our environment.

STEM Career Connection

Wildlife Biologist / Herpetologist
Herpetologists are scientists who study snakes, lizards, and other reptiles. They spend time in nature observing how snakes behave, what they eat, and how they survive. They might study warning coloration to understand how snakes evolved their bright colors and how predators respond to them. Some herpetologists work at zoos or universities; others work in rainforests or deserts conducting field research. They help protect endangered snake species and teach people that most snakes aren't dangerous.
Average Annual Salary: $63,000 - $85,000 USD

Zookeeper / Animal Care Specialist
Zookeepers care for animals in zoos and wildlife facilities, including snakes. They clean habitats, prepare food, monitor the animals' health, and help educate visitors about animals and their adaptations. A zookeeper working with snakes learns about their warning colors, behaviors, and needs. They might present snakes to school groups and explain why the bright colors matter. This job requires patience, physical activity, and a love of animals.
Average Annual Salary: $28,000 - $40,000 USD

Evolutionary Biologist / Research Scientist
Evolutionary biologists study how animals change and adapt over time, including why warning colors developed. They conduct experiments and analyze data to understand natural selection. Some work in laboratories; others study wild populations. They might compare DNA from snakes with different warning colors to understand which genes control bright coloration. Their research helps us understand how all animals—including humans—evolved to survive in their environments.
Average Annual Salary: $70,000 - $95,000 USD

NGSS Connections

Performance Expectation:

- 5-LS1.A: Structure and Function – Students understand how plants and animals have body structures that support growth, survival, and reproduction.

Disciplinary Core Ideas:
- 5-LS2.A – Organisms interact with their environment; some interactions help one organism and harm another (predator-prey)
- 5-LS4.B – Natural selection leads to the predominance of certain traits in a population
- 5-LS4.C – Adaptation by natural selection acting over generations eons produces a range of traits within any species

Crosscutting Concepts:
- Patterns – The bright banding pattern is a predictable signal in nature
- Cause and Effect – Bright colors cause predators to avoid the snake; avoidance causes the snake to survive
- Structure and Function – The color pattern's structure allows it to function as a warning signal

Science Vocabulary

* Adaptation: A body part or behavior that helps an animal survive and thrive in its environment
* Warning Coloration: Bright colors that tell other animals "stay away, I'm dangerous!"
* Natural Selection: When animals best suited to their environment survive and pass their traits to their babies
* Predator: An animal that hunts other animals for food
* Prey: An animal that is hunted by other animals
* Mimicry: When one animal copies the appearance of a different, more dangerous animal

External Resources

Children's Books:
- Snakes by Seymour Simon (explores snake adaptations and behaviors with photographs)
- National Geographic Little Kids First Big Book of Snakes by Jill McDonald (engaging illustrations and age-appropriate facts)
- The Coral Snake: A True Book by Christine Petersen (focuses specifically on warning coloration and coral snakes)

Teacher Notes: This lesson connects abstract evolutionary concepts to observable, concrete examples. The bright colors students can see make natural selection tangible and memorable. Consider having images of both coral snakes and kingsnakes (which mimic them) available to deepen understanding of mimicry.