



CD-1534

SCIENCE ACTIVITY BOOK

Learning About

AMPHIBIANS

Grades
4-8+

- Anatomy • History • Classification • Behavior • Metamorphosis • Conservation
- Creative Writing • Research • Vocabulary • Observation Activities and More!

Animal Life Series



By Debbie Routh

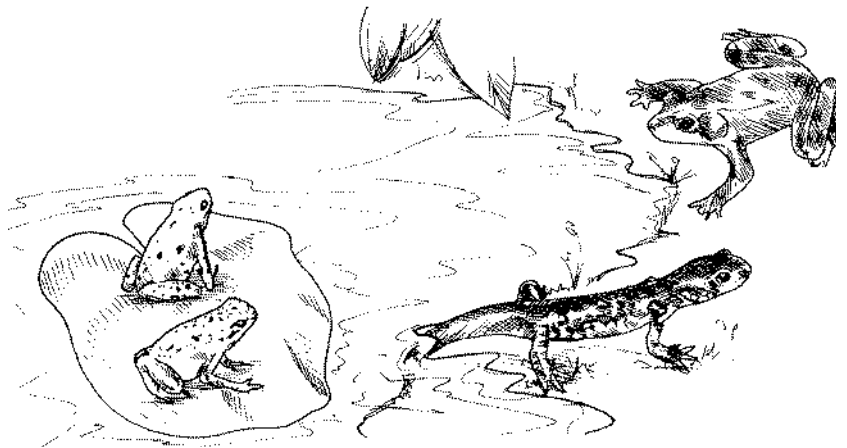
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Introduction

Welcome to a series of books devoted to the Phylum *Chordata*. A **chordate** is an animal that has a **spine** (backbone), which is made up of small bones called **vertebrae**. Most chordates have specialized body systems and paired appendages; all at some time have a notochord, a dorsal nerve cord, gill slits, and a tail.

every animal in the animal kingdom can be subdivided into two main groups. the **invertebrates** (without backbones) make up 95 percent of all the known animals. the **vertebrates** (with backbones) make up only five percent of the animal kingdom. the vertebrates (chordates) are then divided even further into seven groups called classes—jawless fish, cartilaginous fish, bony fish, amphibians, reptiles, birds, and mammals. each class has special characteristics all its own.

this book is devoted to the special **class** (group) of vertebrates called **amphibians**. the word *amphibian* comes from the Greek word *amphibios*, which means “double life.” they are well named, for amphibians are vertebrates that spend part of their lives in water and part of their lives on land. Amphibians have thin, moist skin; most have lungs and a three-chambered heart; many undergo metamorphosis. the class *amphibia* includes frogs, toads, salamanders, newts, and caecilians.



Student observers will use many scientific process skills to discover the world of frogs, toads, newts, salamanders and caecilians—their habitats, behavior, and natural history. the reinforcement sheets that follow the lessons contain at least one higher-level thinking question. So, student observers, put on those thinking caps and use your process skills to observe, classify, analyze, debate, design, and report. this unit contains a variety of lessons that will help you practice scientific processes as you make exciting discoveries about these remarkable and changeable creatures called amphibians.

* **Teacher note:** each lesson opens with a manageable amount of text for the student to read. the following pages contain exercises and illustrations that are varied and plentiful. Phonetic spellings and simple definitions for terms are also included to assist the student. the lessons may be used as a complete unit for the entire class or as supplemental material for the reluctant learner. the tone of the book is informal; a dialogue is established between the book and the student.

Invertebrates and Vertebrates

The animal kingdom is made up of more kinds of **organisms** (living things) than the other four kingdoms. Scientists **classify** (group) animals into two large groups. one group is made up of animals that have a backbone. the other group is made up of animals without a backbone.

Invertebrates

An **invertebrate** is an animal that doesn't have a backbone. this is by far the largest group of animals. the invertebrates make up 95 percent of all the known animals. Scientists have already given names to over one million species of invertebrates. invertebrates have an **exoskeleton** (skeleton on the outside) or no skeleton at all. the exoskeleton is on the outside of the body and is made up of a hard, waterproof substance called **chitin**. the exoskeleton protects and supports the body. Some invertebrates must **molt** (shed) their exoskeleton in order to grow. A grasshopper may molt seven times in order to reach adulthood. there is always a reason for everything an animal does. Most of an animal's behavior has something to do with the three basic needs. every animal needs food, oxygen, and shelter. An animal can only stay alive if it has food and water to eat and drink, oxygen to breathe, and shelter for protection from weather and enemies. When you are watching invertebrates, can you guess why they do the things they do?

invertebrate animals include sponges; corals and jellyfish; worms; starfish and sea urchins; mollusks, such as snails and octopuses; and arthropods, such as insects, spiders, and crabs.

Vertebrates

A **vertebrate** is an animal that has a backbone. A **backbone** consists of a spinal column and a **cranium** (brain case). the vertebrates are the smallest group of animals. only five percent of the known species of animals are vertebrates. Vertebrates live in water as well as on land. they are the most complex organisms in the animal kingdom. they are also the most familiar of all the animals. the largest animals on earth are vertebrates. Vertebrates can grow very large because they have an **endoskeleton** (skeleton on the inside of the body). the endoskeleton does not limit the growth and size of the animal. the endoskeleton covers and protects the soft body parts. it gives shape to and supports the animal's body. Vertebrates include fish; amphibians, such as frogs and toads; reptiles, such as snakes and lizards; birds; and mammals. in fact, you are a vertebrate.



Name: _____ Date: _____

Invertebrates and Vertebrates: *Reinforcement Activity*

To the student observer: Do you know the difference between an invertebrate and a vertebrate?

Analyze: identify the characteristic that divides the animals into two large groups.

Directions: Answer the following questions.

1. What two groups make up the animal kingdom? _____

2. What is the difference between a vertebrate and an invertebrate? _____

3. Which group is the most familiar group? _____
4. Which group is the largest group? _____
5. Which group do amphibians belong to? _____
6. What is an exoskeleton? _____

7. What is an endoskeleton? _____

8. What is chitin? _____

9. What must an invertebrate do in order to grow? _____

10. What are three basic needs all animals have? _____

An Internal Affair

The Backbone

the backbone or spine is a long column of bones called **vertebrae** that run along the animal's back. the spine connects to the **cranium** (brain case). Most vertebrates have vertebrae made of bones. Some have vertebrae made of cartilage. You can feel your vertebrae by running your hand down the back of your neck and between your shoulder blades. the row of hard, bony lumps runs all the way down to your bottom. this is your backbone.



When you touch a hot pan, your nerves relay a message to your brain, telling you that you are feeling

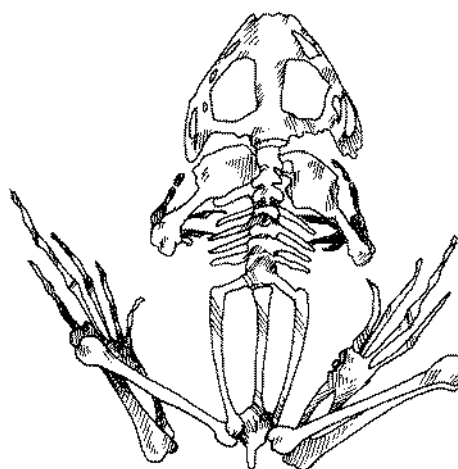
the backbone has a very important job to do. every vertebra has a hole in the middle and is joined to the next by a pad of **cartilage** (KARt ul idj). Cartilage is a soft, flexible tissue that is rubbery and cushions the bony vertebrae. the backbone is like a hollow, flexible tube. through the middle of the tube runs the **spinal cord** (a thick bundle of nerves) receives and sends messages from the brain. the spinal cord also receives messages from the animal's body and carries the information to the brain. the brain interprets this information and sends messages back to the rest of the body. imagine how busy the nerves in your backbone are. thousands of messages rush along them every second. the backbone protects this passageway of nerves. the **nervous system** is made up of the brain, the spinal cord, and nerves. the animal's nervous system

controls all body activities. if the spinal cord is damaged, the messages can't get through from the nerves to the brain or from the brain to the nerves. Sometimes, if an animal injures its back, it can't move certain parts of its body.

The Skeleton

Some animals do not have a skeleton; their bodies are soft. other animals have a skeleton on the outside of the body called an **exoskeleton**. the animals we are studying in this unit have a skeleton on the inside of the body, called an **endoskeleton**.

the skeleton makes a framework that supports and shapes the animal's body. the skeleton affects the way an animal moves. the bones work together with muscles to move the body. Another job of the skeleton is to protect organs. For example, the ribs protect the lungs. Do you know what the skull protects?



Name: _____ Date: _____

An Internal Affair: *Reinforcement Activity*

To the student observer: Can you imagine how busy the nerves in your backbone are today? Can you name one message your brain received during the past hour?

Analyze: Nerve cells do not reproduce themselves like other body cells. What might happen if all the nerve cells in your feet were destroyed?

Directions: Answer the following questions.

1. What is the backbone, and what does it do? _____

2. What are the main parts of the backbone? _____

3. What is the spinal cord, and what does it do? _____

4. What happens when the spinal cord is damaged? _____

5. What is the nervous system, and what does it do? _____

6. What is the skeleton, and what does it do? _____

What Is an Amphibian?

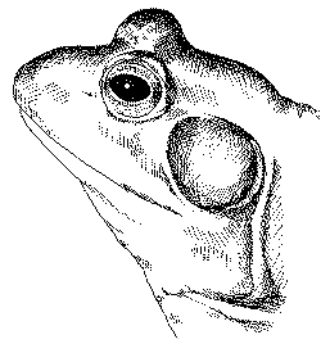
Kingdom: *Animalia*

Phylum: *Chordata*

Subphylum: *Vertebrata*

Class: *Amphibia* (am FiB ee uh)

Means “double life”



Amphibians are a class of vertebrates. Vertebrates are animals that have a bony internal skeleton built around a backbone. Amphibians are **ectothermic** (cold-blooded) just like fish and reptiles. they cannot produce their own body heat the way warm-blooded animals can. if the temperature around them is cold, the amphibian becomes cold and lazy. the amphibian's body functions slow down.

the name *amphibian* means “double life.” this refers to the fact that they live part of their lives in water and part of their lives on land. the **tadpoles** (young forms) have gills and must live in water. the adult forms have lungs and may live on land. Lungs allow an animal to take in oxygen from the air. Frogs go through a life cycle called **metamorphosis**. Metamorphosis is a change of form from egg to tadpole to adult frog.

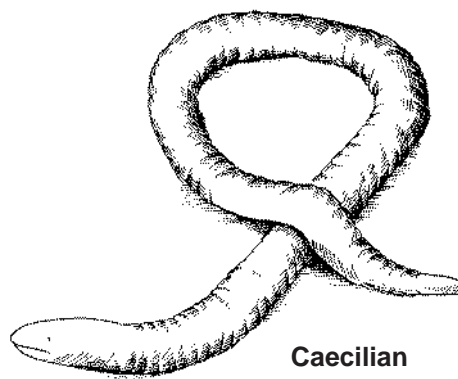
have you ever picked up an amphibian? the skin of most amphibians is soft and moist. toads, however, have dry, rough skin covered with bumps that look like warts. Amphibians usually feel sticky to the touch. Many amphibians have a thick, slimy substance called **mucous** that keeps the skin moist. Some amphibians have special glands, called parotoid glands, that secrete a poisonous substance. Because their skins are not waterproof and cannot hold in moisture, they are usually found in moist places. Amphibians can absorb oxygen through their skins.

Amphibians must return to water to mate and lay their eggs. Amphibian eggs are called **spawn**; they do not have a shell and would dry out if they were laid on land. the females of most toad and frog species lay hundreds of eggs at once. Frogspawn is laid in one big mass; toadspawn is laid in long strings. other female amphibians lay their eggs one at a time beside underwater plants.

there are about 3,000 different species of amphibians. Living amphibians are divided into three **orders** (groups) based on their body structures: frogs and toads; salamanders, sirens, and newts; and the odd caecilians (see SiL ee uns).



Salamander



Caecilian

Name: _____ Date: _____

What Is an Amphibian?: *Reinforcement Activity*

To the student observer: What characteristics of amphibians can you identify?

Analyze: Which amphibian characteristics explain why amphibians need a moist habitat?

1. Solve the puzzle below:

- | | |
|---------|--|
| A _____ | A/An _____ is an animal that lives part of its life in water and part on land. |
| M _____ | Amphibian _____ “double life.” |
| P _____ | Amphibians belong to the Chordata _____. |
| h _____ | Frogs do not produce their own body _____. |
| i _____ | Vertebrates have a bony _____ skeleton. |
| B _____ | Amphibians are grouped according to their _____ structures. |
| i _____ | When an amphibian gets cold, everything going on _____ its body slows down. |
| A _____ | _____ are a class of vertebrates. |
| N _____ | Frogs _____ a moist habitat. |
| S _____ | Most amphibians produce a slimy _____ called mucous. |

2. Answer the following questions.

a. What are the three groups of amphibians? _____

b. Name four characteristics of amphibians. _____

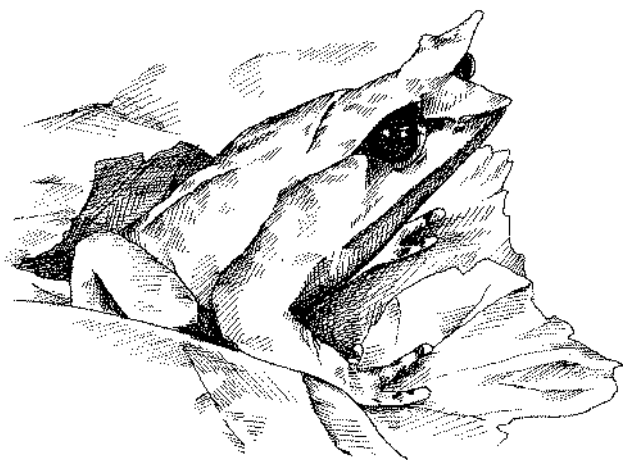
Herpetology: "Crawling Things"

Scientists used to think amphibians and reptiles were closely related, so they **classified** (grouped) them together. Scientists today realize that while they look very much alike on the outside, on the inside they are very different. Scientists have studied live specimens and dissections of both classes. Because of these studies, we now know amphibians are not reptiles. Amphibians have no scales, can breathe through their moist skin, and need to return to water to lay their unprotected eggs. Scientists also discovered that amphibians develop differently; they must go through metamorphosis. **Metamorphosis** is a change in development as the young amphibian grows from an egg to a larva to an adult. Reptiles do not go through metamorphosis. When reptiles hatch, they are exact images of their parents.

Both classes are vertebrates, and both are ectothermic, which means that they obtain heat from outside sources. They must move to warmer or cooler surroundings as the need arises. Cold-blooded (ectothermic) animals have an advantage over warm-blooded (endothermic) animals because they do not have to maintain a constant body temperature for their survival. This allows amphibians to be able to go for long periods of time between meals.

In some cold climates, the amphibian adjusts to its surroundings by hibernating. The state of **hibernation** is when an animal's body functions slow down; the entire body becomes at rest. It will remain in this state and live off its body fat until warmer conditions return. In some climates, such as the hot desert, an amphibian may find the need to escape the extreme heat and dryness by **estivating**. This is very similar to hibernating except the animal finds a cool spot and slows down all body functions until cooler conditions return. Warm-blooded animals' body temperature remains constant no matter what the surrounding temperatures are like. They usually do not need to hibernate or estivate like cold-blooded animals.

Herpetology is a branch of science that deals with both amphibians and reptiles. The name of this science comes from the Greek word, *herpeton*, which means "crawling things." Herpetologists study all aspects of amphibians and reptiles. They are very involved with the conservation and protection of these animals.



Malaysian Leaf Frog



Horned Frog

Name: _____ Date: _____

Herpetology: *Reinforcement Activity*

To the student observer: What is herpetology? _____

Analyze: Why do modern scientists believe reptiles and amphibians belong in different classes (groups)?

1. Why were amphibians and reptiles grouped together? _____

2. What are ectothermic animals? _____

3. What is an endothermic animal? _____

4. What advantage does a cold-blooded animal have over a warm-blooded animal?

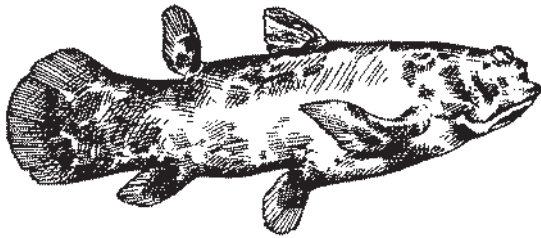
5. What is hibernation? _____

6. What does it mean if an animal estivates? _____

7. What is metamorphosis? _____

Ancient Amphibians: *The History of Amphibians*

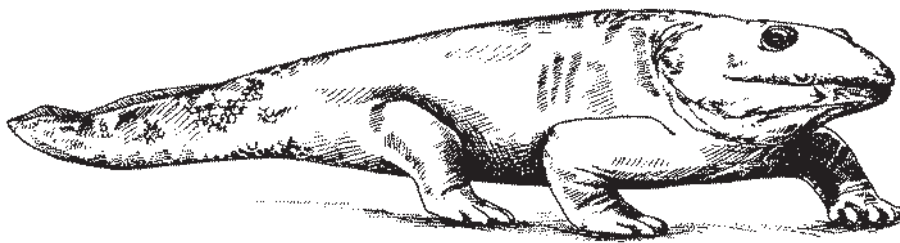
Ancestors



Lobe-finned fish

Some scientists believe the first amphibians appeared on earth during the Devonian period. They have hypothesized that the first vertebrates to settle on land were amphibians. These scientists believe the ancestors of amphibians were a group of fish called lobe-finned fish. The lobe-finned fish developed bony supports for their fins and lungs for breathing air. The fleshy-lobed fins looked like legs and allowed them to haul themselves out of water and onto land. On

land, they found new sources of food, mostly spiders and insects, and fewer enemies to prey on them. These are believed by some to have developed into early amphibians, such as the "*Ichthyostega*" (iK thee oh SteG a), which flourished on the land.



Ichthyostega

Ancient Amphibians

The oldest amphibian fossils show they were more varied in size and shape than they are today. The fossils show they had many features related to living on land. Their skeletons had a hip and shoulder girdle to support limbs. The skull was separated from the rest of the back, indicating a flexible neck. These amphibians had ears that could hear in air, eyelids to keep their eyes moist, and tongues to moisten and move food. Some ancient amphibians, such as the *Mastadonasauras*, were huge animals over 6 feet long. These ancient amphibians ruled the land until the dinosaurs overcame them. Only a few species survived to become the modern amphibians of today.

Modern Amphibians

Today's modern amphibians are smaller and less varied than the ancient amphibians, but they are still dependent on water for their survival. Most amphibians need water for their moist, scaleless skin and their shell-less eggs. The young amphibian starts life in a larva stage called a **tadpole**. The young larva breathes with structures called **gills** before it goes through a series of changes to become an adult. The adult carries on respiration by obtaining oxygen through its lungs and moist skin.