

# The Animal Kingdom-II

## Animals With Backbones

### 18A INTRODUCTION

The most complex and successful form of animals belong to the phylum CHORDATA. You are a member of this phylum, the ninth phylum to be studied in this unit. A chordate is an animal that, at some time in its life, has a stiff rod or cord running down its back.

As a chordate develops, the cord is usually replaced by a backbone, also called a spinal column, or VERTEBRAE. Therefore, a VERTEBRATE is an animal with a backbone.

#### VERTEBRATES HAVE

- a backbone
- an ENDOSKELETON, or skeleton on the inside of the body
- a large brain in a skull
- an advanced nervous system
- a complex heart and circulatory system
- a special kind of outer covering
- one or two pairs of appendages

The vertebrates have been divided into five major classes. They are the fish, amphibian, reptile, bird, and mammal classes.

1. What is a chordate?
2. What are some characteristics of vertebrates?
3. Name five classes of vertebrates.

### 18B THE FISH CLASS

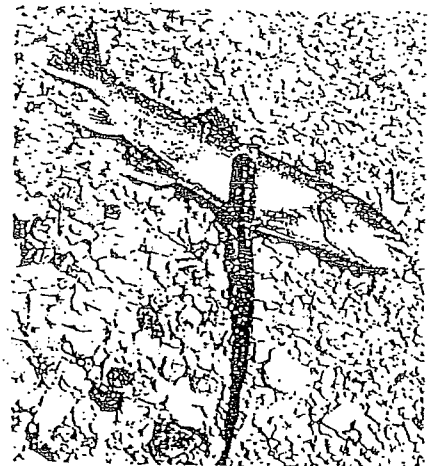
There are really three classes of fishes. The first class includes the lamprey. Lampreys are parasites. Lampreys have a circular mouth with teeth on their tongues, which they use to attach themselves to another fish's body. Lampreys destroy great numbers of valuable food fish, such as pike and trout.

The second class of fish includes the shark, skate, and ray. A shark is not a true fish. Sharks do not have scales or bones in their skeleton. The skeleton of a shark is made of CARTILAGE, a tough tissue that bends easily.



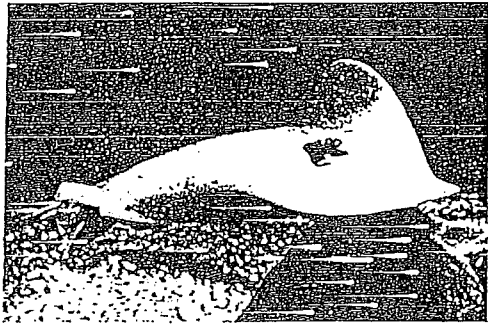
Dinosaurs, like this Tyrannosaurus Rex, were chordates.

The lamprey in this photograph is feeding on a Great Lakes trout.



The ray, skate, and shark shown here belong to the same class. They have a skeleton of cartilage and do not have scales.

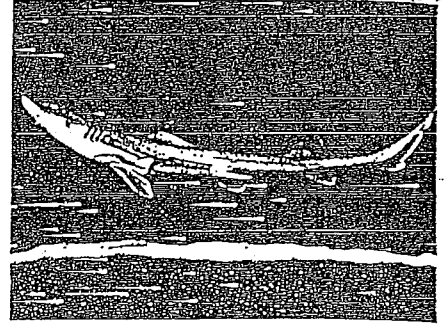
Sharks do not have a flap of skin covering their gills as some other fishes do. Sharks just have five to seven rows of slits. A shark cannot rest. It must keep swimming all the time to keep water flowing across its gills to enable it to breathe.



RAY



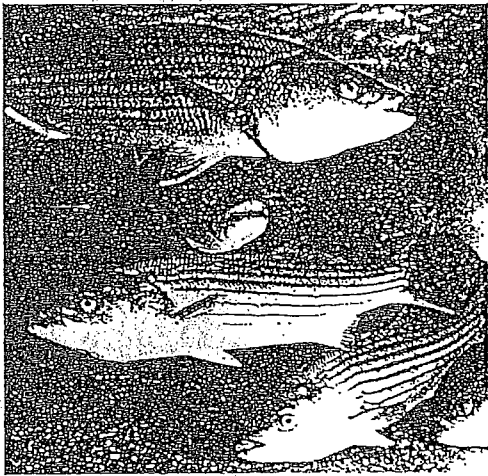
SKATE



SHARK

Sharks are large, larger than all other kinds of fishes. The heaviest known shark was 40,823 kilograms and was 18 meters long.

The third class of fish consist of bony fish, or true fishes. True fishes have a bony skeleton and are covered with scales. Bony fish are what people commonly call fish. For example, salmon, trout, tuna, halibut, swordfish, snapper, and bass are bony fish.



The bass shown here are true fish.

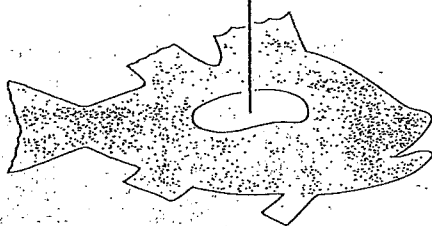
#### THE CHARACTERISTICS OF FISHES

- skeleton of bones covered with scales
- fins for swimming
- gills for breathing
- two-chambered heart
- coldblooded

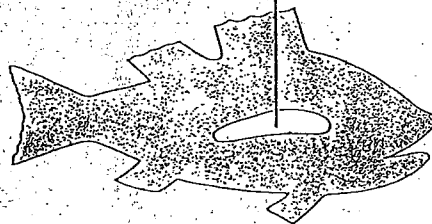
The shape of a fish makes it particularly well-suited for swimming. Fins stabilize a fish's movements and help it to change direction. Some fish have a SWIM BLADDER, a gas-filled bag that enables them to go from shallow to deep water.

Fish obtain oxygen by gulping water and passing the water over their GILLS. The gills absorb the oxygen from the water, and the oxygen is passed, by osmosis, into the blood vessels. The heart then pumps the blood with its oxygen to all the cells.

Swim bladder inflated to float



Swim bladder deflated when swimming

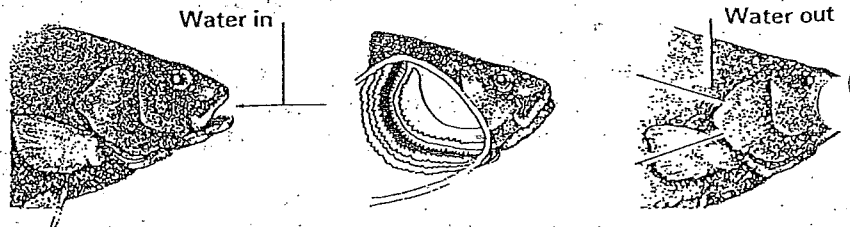


#### HOW A FISH BREATHE

Breathing in

Breathing out

Water passes over rows of gills and oxygen is absorbed.



Fish are **COLDBLOODED**. This means that their body temperature changes with the temperature of their surroundings.

4. What are lampreys and why aren't they true fishes?
5. Is a shark a true fish? Explain.
6. What is cartilage?
7. Why must a shark keep swimming?
8. Why is a bony fish a true fish?
9. How does a fish swim at different depths in the water?
10. How does a fish obtain oxygen?
11. What does coldblooded mean?

## 18C THE AMPHIBIAN CLASS

The **AMPHIBIANS** include such animals as the frog, toad, and salamander.

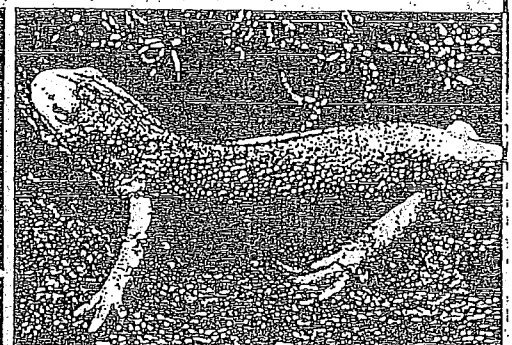
The newt, frog, and salamander shown here are amphibians.



NEWT



FROG



SALAMANDER

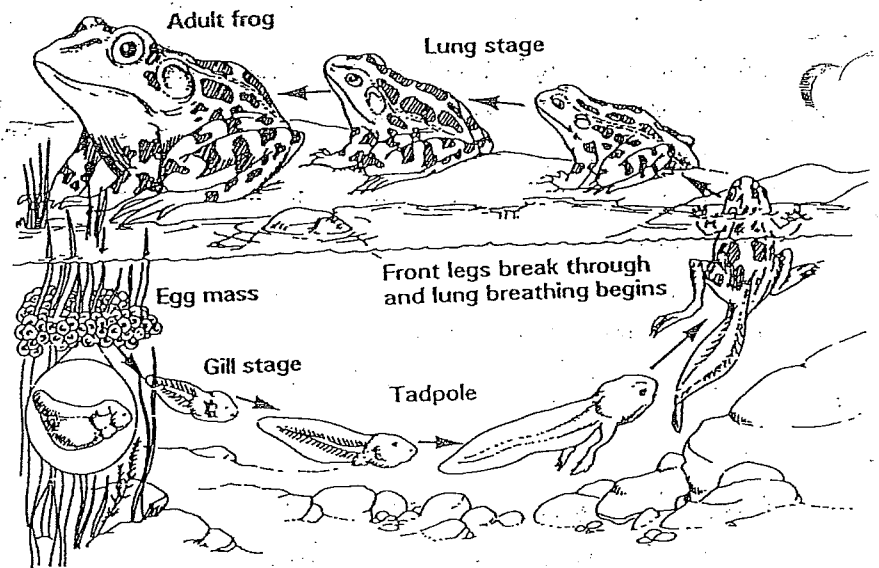
### THE CHARACTERISTICS OF AMPHIBIANS

- gills in their tadpole stage
- lungs in their adult stage
- three-chambered heart (adult)
- coldblooded
- smooth, thin skin

Amphibians live both in water and on land. They live part of their life in water because water is necessary for their reproduction and the development of their fertilized eggs. Amphibians begin their lives in the water as **TADPOLES**. A tadpole breathes with gills, has a two-chambered heart, and has two legs. The tadpole undergoes a series of changes, a metamorphosis, to become an adult.

The adult amphibian lives on land, breathes with lungs, has a three-chambered heart, and has four legs. The adults must return to the water to lay their eggs.

## FROG METAMORPHOSIS



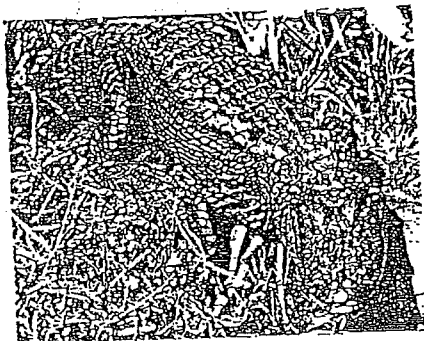
The metamorphosis of a frog can take from two months to two years.

12. Name some amphibians.
13. What are some characteristics of amphibians?
14. Why must amphibians live part of their life in the water?
15. How does the water form of amphibians differ from the land form?

## 18D THE REPTILE CLASS

The REPTILES include such animals as the snake, lizard, crocodile, and alligator.

The alligator, lizard, and iguana shown here are reptiles.



ALLIGATOR



LIZARD



IGUANA

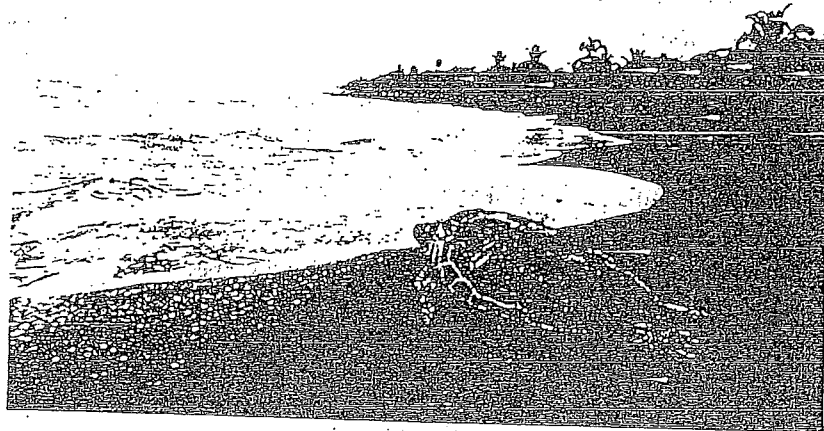
### THE CHARACTERISTICS OF REPTILES

- breathe with lungs
- scaly, dry skin
- eggs can be fertilized inside the female
- three- to four-chambered heart
- coldblooded
- limbs suitable for moving on land (except for snakes)

The reptile was the first kind of animal to live its entire life successfully on land. Two factors made this possible: (1) INTERNAL FERTILIZATION and (2) a protected egg.

Internal fertilization occurs when sperm cells are placed directly in the female. All amphibians, fishes, and invertebrates have to lay their eggs in the water to keep them moist. Reptiles lay their eggs on land.

After a reptile's egg is fertilized, a leathery shell is produced by the female to protect it. Also, the eggs are laid in a sheltered place. The protection given an egg is one example of why vertebrates are the most successful of all animals.



The sea turtle comes on land to lay its eggs and returns to the sea, never to see its young.

16. Name some reptiles.
17. What are some characteristics of reptiles?
18. What factors make it possible for reptiles to live on land?
19. What is internal fertilization?
20. How does a reptile protect its eggs?
21. Give one reason why vertebrates are the most successful of all animals.

## 18E THE BIRD CLASS

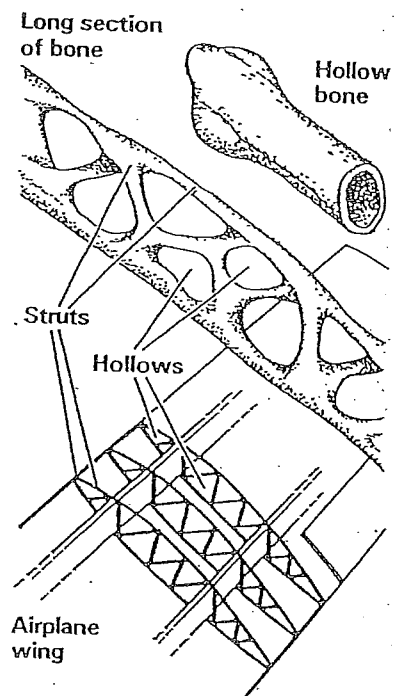
### THE CHARACTERISTICS OF BIRDS

- covered with feathers
- wings for flying
- light, hollow bones
- four-chambered heart
- warmblooded
- external development of eggs
- two legs for support and balance
- mouth in shape of beak

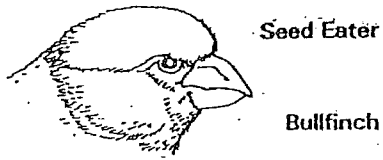
Most birds can fly. A bird's body is light because its bones are hollow and light. Birds also have large and powerful breast muscles to move their wings in flight.

The bones of a bird are like the wings on an airplane. Both are hollow with supports, or struts, inside.

### WHY BIRDS CAN FLY



## THE BEAKS OF BIRDS



Seed Eater

Bullfinch



Fruit Eater

Thrush



Insect Eater

Great spotted woodpecker



Fish Eater

Herring gull



Meat Eater

Vulture

To keep them warm at high altitudes and at high speeds, birds have two layers of feathers. They have small feathers, called **DOWN FEATHERS**, underneath their outside layer of feathers. The **down feathers** form an **inside sweater** covered by an **outside jacket of feathers**. The muscles also work to produce heat to keep the bird warm.

A bird is **WARMBLOODED**. This means that the body temperature stays the same regardless of the outside temperature.

**Birds do not have teeth; they have beaks.** The shape of a bird's beak shows what type of food the bird eats.

All birds lay eggs. Birds do not carry their babies inside of them, because that would make them too heavy to fly. After the eggs are laid they must be kept warm at a temperature of at least  $34^{\circ}$  Celsius.

22. What are some characteristics of birds?

23. Give two reasons why birds can fly.

24. A bird is warmblooded. How does this make the bird a successful vertebrate?

25. Why do birds have different shaped beaks?

26. Why do birds lay eggs?

## 18F THE MAMMAL CLASS

The most highly developed animals are the **MAMMALS**. Example of mammals are the human, whale, spiny anteater, bat, and elephant. The main characteristic of mammals is that they have **MAMMARY GLANDS** that produce milk to feed their young.

### THE CHARACTERISTICS OF MAMMALS

mammary glands

young born alive

four-chambered heart

warmblooded

highly developed brain

covered by hair or fur

There are two major groups of mammals: those with a placenta and those without a placenta. A **PLACENTA** is a bag inside the mother in which the baby grows and develops. The time period during which the baby develops inside the placenta is called the **GESTATION, PREGNANCY, period**.

The **highest form of life** are the **placental mammals**. The advantage of a gestation period is that the baby is born more fully developed. **Placental animals** provide a great amount of parental care to their young. This is another reason why vertebrates are the most successful form of animals.

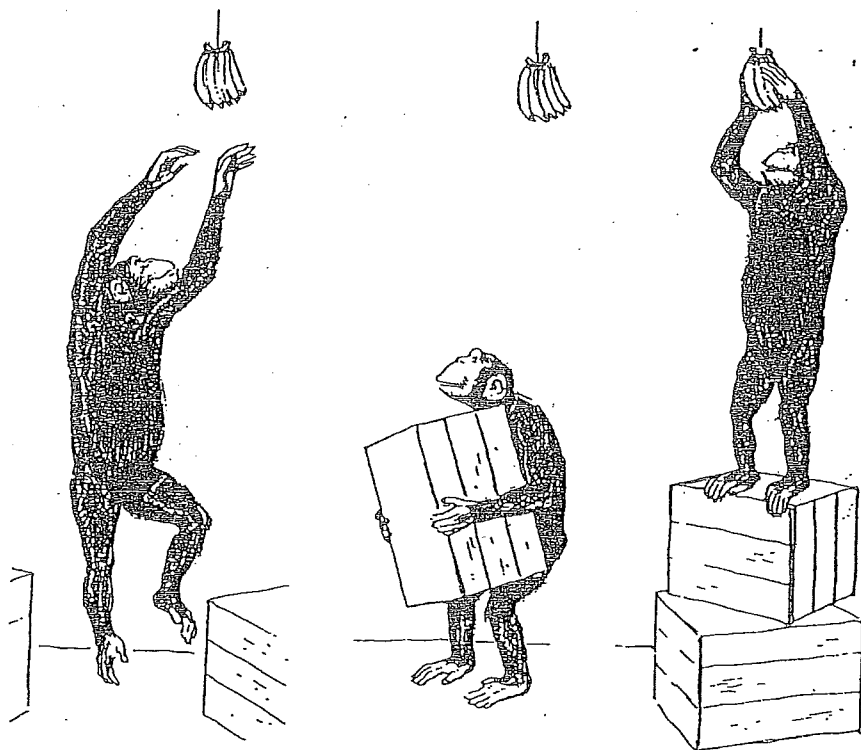
The **PRIMATES** are the most highly developed of the placental mammals.

## ANIMAL GESTATION PERIODS AND LITTERS

ANIMAL	GESTATION PERIOD	LITTER SIZE	ANIMAL	GESTATION PERIOD	LITTER SIZE
American Buffalo (Bison)	270-285 days	1	Horse	11 months	1
Baboon	6 months	1-2	Kangaroo	38-39 days	1-2
Black Bear	7 months	1-4	Lion	108 days	1-4
Camel	12-13 months	1	Macaque	160-170 days	1-2
Cat	63 days	1-6	Mink	48-51 days	4-8
Chimpanzee	226 days	1-2	Mouse	19-21 days	1-9
Chinchilla	105-111 days	1-4	Opossum	12-13 days	4-13
Cow	280 days	1-2	Otter	9½-12½ months	1-4
Deer (White-Tail)	7 months	2	Pig	112-115 days	4-6
Dog	61 days	1-12	Rabbit	1 month	1-13
Dolphin	9 months	1	Raccoon	63 days	1-6
Elephant	21 months	1	Sheep	150 days	1-3
Fox	49-55 days	1-8	Skunk	52 days	4-7
Gerbil	14 days	1-7	Squirrel	44 days	2-5
Giraffe	14-15 months	1	Tiger	100-108 days	2-4
Gorilla	8½ months	1	Wolf	60-63 days	1-13
Hamster	16-19 days	2-12	Yak	just over 9 months	1
			Zebra	11-12 months	1

Source: Grace Devell, Assistant Curator, Mammals and Birds, New York Zoological Society

Primates have large brains. Primates have been able to construct and use tools to build and change their environment. Primates can also communicate and think on a high level. Some primates have even been able to develop a complex society.



Primates are the most highly developed and intelligent of all animals. This ape has figured out how to get the bananas.

27. Give two reasons why mammals are so highly developed.
28. What are some characteristics of mammals?
29. What is a placenta?
30. What is the advantage of a gestation period?
31. Why are the primates the most highly developed animals?
32. Why have the vertebrates been so successful?

