



Fossils have been found in Precambrian rocks 3.5 billion years old. But most have been found in rocks of the Paleozoic, Mesozoic, and Cenozoic eras, which are all less than 550 million years old. The types of organisms found in different rocks can provide important information about the history of life on Earth. The term **fossil record** refers to all of the fossils that have been found on Earth.

The fossil record has been used to classify fossils into families. A family is a category smaller than a kingdom, phylum, class, or order, but larger than a genus or species. For example, dogs are in the family Canidae, which also contains foxes, jackals, coyotes, and wolves. Lions are in the same kingdom, phylum, class, and order as dogs, but they are in a different family: Felidae. This family includes leopards, tigers, cheetahs, house cats, and extinct species such as the saber-toothed cat. You will investigate how the numbers of families in the fish, mammal, and reptile classes have changed over geological time.

CHALLENGE

What can you learn about evolution by comparing the fossil records of fish, mammals, and reptiles?

MATERIALS



For each student

- 1 Student Sheet 98.1, "Graphs of Fossil Families"
- 1 set of colored pencils (optional)

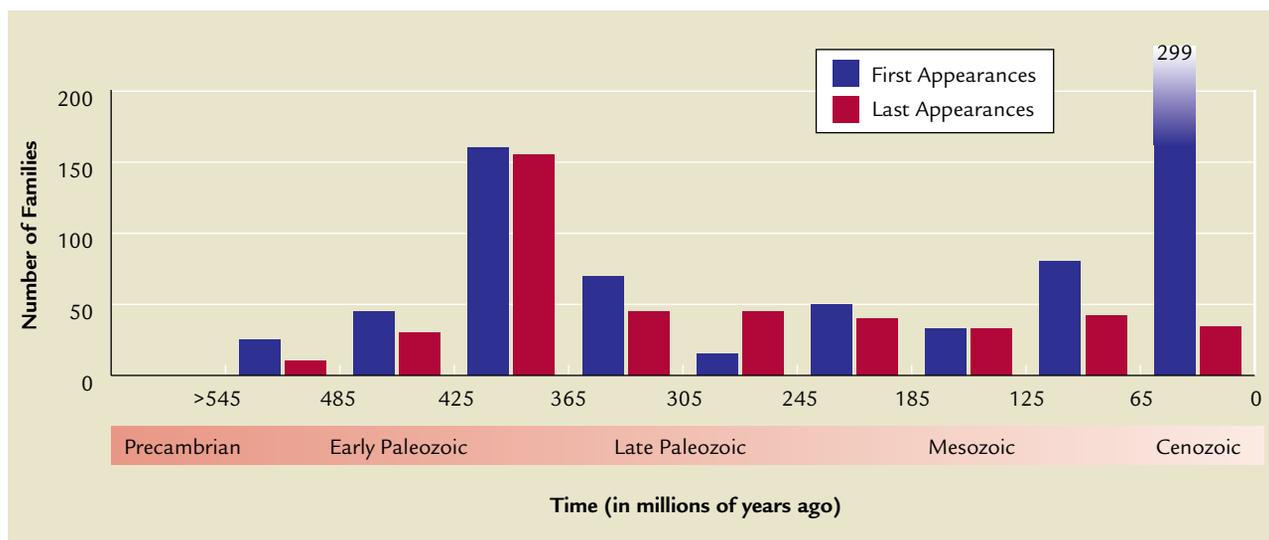
Classifying Carnivores		
Classification Level	Dogs	Lions
Kingdom	Animalia	Animalia
Phylum	Chordata	Chordata
Class	Mammalia	Mammalia
Order	Carnivora	Carnivora
Family	Canidae	Felidae
Genus	<i>Canis</i>	<i>Panthera</i>
Species	<i>familiaris</i>	<i>leo</i>

PROCEDURE

1. Table 1 below provides the history of all the families of fish currently known from the fossil record. When a fossil is found that does not belong to any family found in *earlier* geologic time periods, we call it a “first appearance.” It is the first appearance of that family in the fossil record. When a fossil is found that does not belong to any family found in *later* geologic time periods, we call it a “last appearance.” It is the last appearance of that family in the fossil record. Look at Table 1 and discuss the following questions with your partner:

- Between which years did the greatest number of fish families appear in the fossil record? In what era was this period of time?
- Between which years did the greatest number of fish families disappear from the fossil record? In what era was this period of time?

Era	Precambrian	Early Paleozoic			Late Paleozoic			Mesozoic			Cenozoic
Time (mya)		>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	25	43	162	67	13	52	33	84	299	
Number of last appearances	0	9	31	158	49	48	36	20	44	34	



- The double bar graph on the previous page is based on the data shown in Table 1. Look at the graph and discuss with your partner in what ways the graph makes the data easier to interpret.
- Use the information in Table 2 to make a double bar graph for families of reptiles, similar to the one for fish shown on the previous page. Since you will be comparing graphs, be sure to use the same scale on the y-axis.

Table 2: History of Fossil Reptile Families										
Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	0	0	0	3	67	95	68	97	35
Number of last appearances	0	0	0	0	1	57	93	46	84	26

Table 3 : History of Fossil Mammal Families										
Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	0	0	0	0	0	6	14	33	404
Number of last appearances	0	0	0	0	0	0	2	8	33	262

- Use the information in Table 3 to make a double bar graph for families of mammals, similar to the one for fish shown on the previous page. Since you will be comparing graphs, be sure to use the same scale on the y-axis.



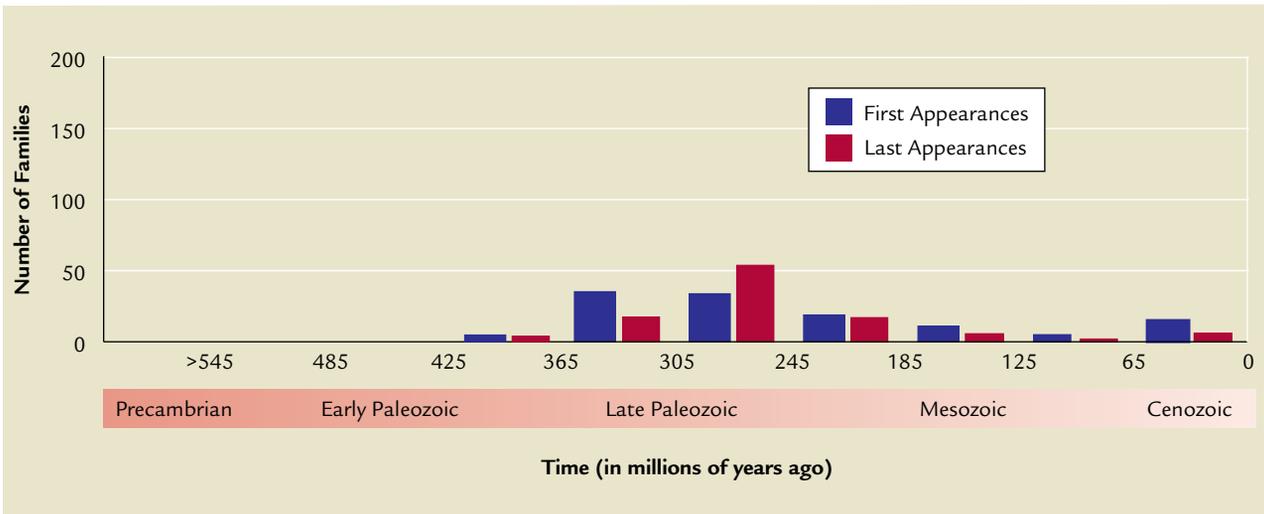
A familiar example of a fossilized reptile

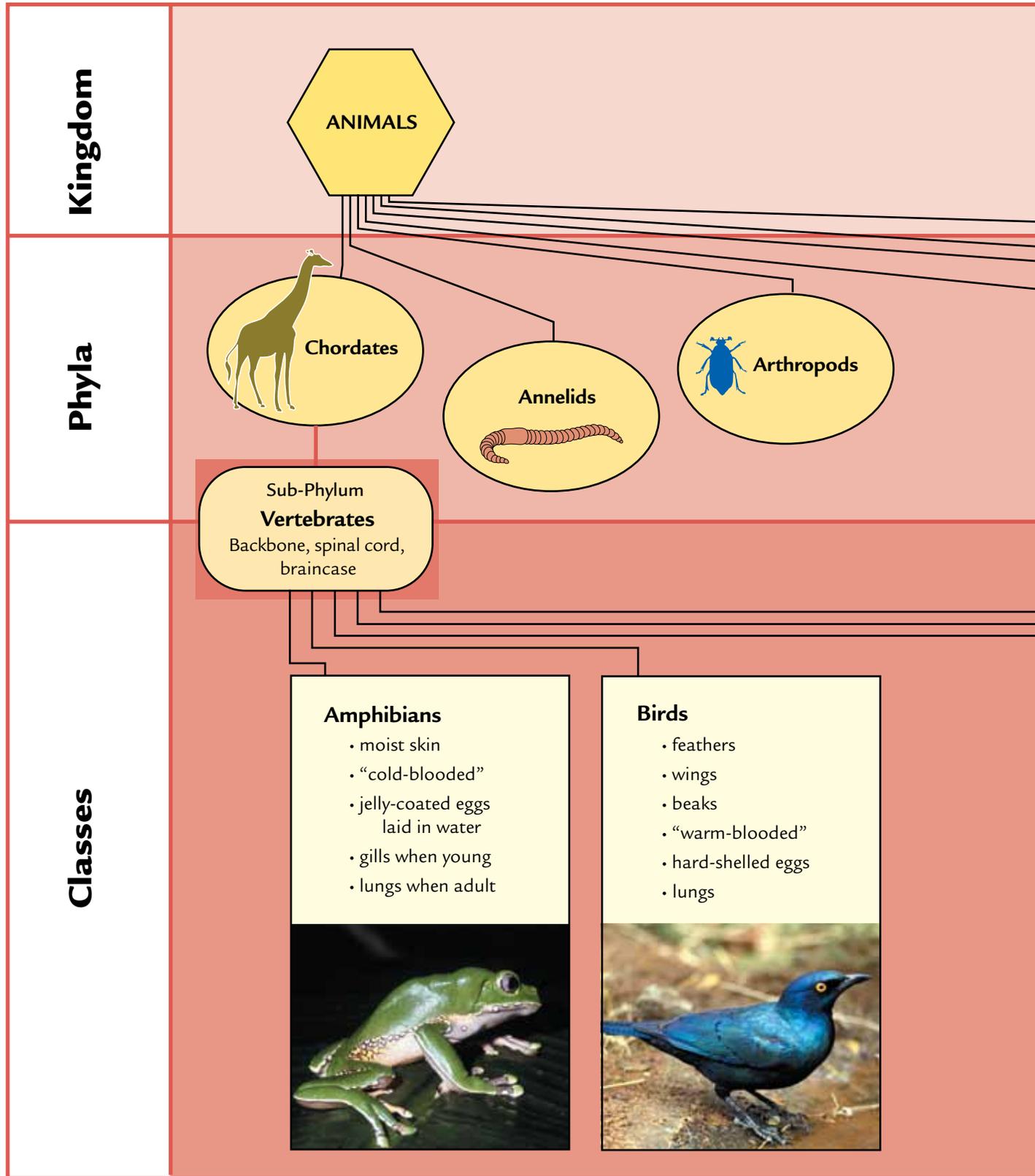
ANALYSIS



1.
 - a. Use the graphs to place the three different classes in order, based on when they first appeared in the fossil record.
 - b. What could this order tell you about the evolution of these types of species?
2.
 - a. What are some possible explanations for the disappearance of a family from the fossil record?
 - b. How could Darwin’s theory of natural selection explain the disappearance of these families?
3. What could explain the appearance of a family in the fossil record?

Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	0	0	3	35	33	19	11	5	15
Number of last appearances	0	0	0	3	16	53	18	5	1	5



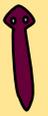


Cnidaria



A yellow oval containing the text "Cnidaria" and a blue and white illustration of a jellyfish with long tentacles.

Flatworms



A yellow oval containing the text "Flatworms" and a purple illustration of a flatworm.

Mollusks



A yellow oval containing the text "Mollusks" and a brown and white illustration of a snail.

Many more invertebrate phyla

Bony Fish

- scaly skin
- “cold-blooded”
- jelly-coated eggs laid in water
- fins
- gills



Mammals

- hair
- “warm-blooded”
- live young
- feed babies milk
- lungs



Reptiles

- dry scaly skin
- “cold-blooded”
- leathery-shelled eggs
- lungs

