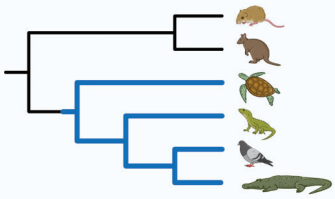
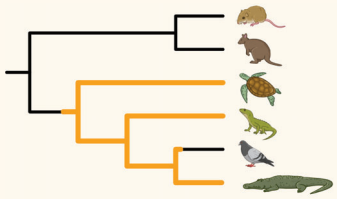
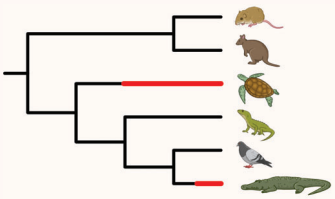
TOPIC: CLADISTICS

Monophyletic, Paraphyletic, & Polyphyletic Groups

- **Cladistics:** classifying organisms focusing on their common _____.
  - **Clade:** ancestral taxon and all its _____; by definition, a clade is a _____phyletic group.
- Terms to describe groups we may be interested in:

_____phyletic Group	_____phyletic Group	_____phyletic Group
A clade: ancestor and _____ of its descendants. • E.g., Sauropsida	Includes the common ancestor but only _____ descendants. • E.g., Reptiles	Does _____ include the common ancestor → _____ traits. • E.g., Swimming reptiles
		

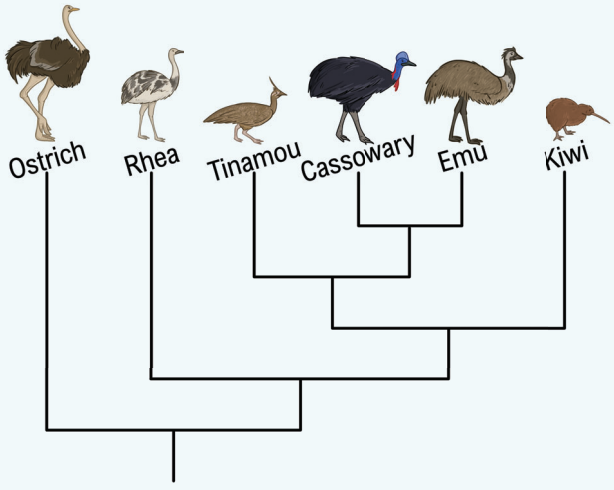
- Para- and polyphyletic groups can be useful _____ of organisms.
  - BUT only monophyletic groups should be used in modern _____.

EXAMPLE

The tree below shows the paleognaths, an infraclass of birds. The ancestor represented by the root of this tree was a flying bird. Of the living species in this group, only the tinamous are capable of flight today.

a) The flightless birds in this groups are called "ratites". Based on this tree, do you think the ratites are a mono-, para-, or polyphyletic group? _____
Why do you think this?
_____

b) Kiwis are the only birds in the world with nostrils at the tip of their beaks. All other paleognaths have nostrils near the midpoint of their beak. Based on this tree, what type of group are the paelognaths with nostrils near the midpoint of their beak? _____
Why do you think this?
_____

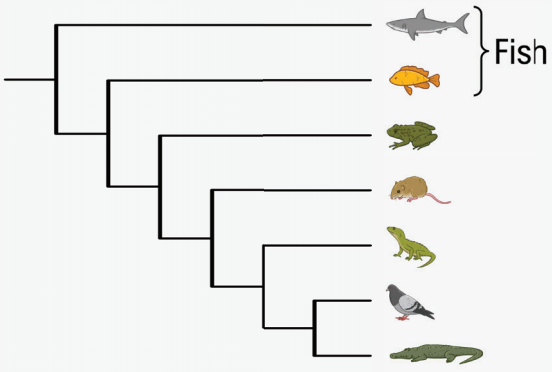


TOPIC: CLADISTICS

PRACTICE

According to the tree below, “Fish” should most likely be considered what type of group?

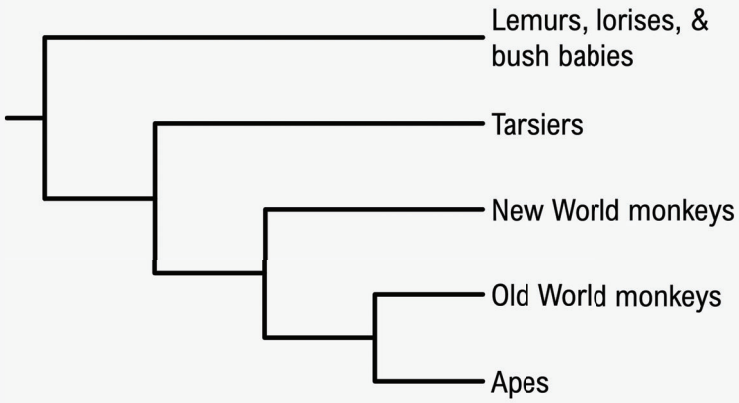
a) Monophyletic.
b) Polyphyletic.
c) Paraphyletic.



PRACTICE

According to the tree below, “monkeys” should most likely be considered what type of group?

a) Monophyletic.
b) Polyphyletic.
c) Paraphyletic.



TOPIC: CLADISTICS

PRACTICE

Traditionally, scientists have identified 4 Kingdoms in the domain Eukaryota: the animals, the plants, the fungi, and the protists. Some scientists argue that the protists actually represent multiple kingdoms, and that there should be many more kingdoms in the domain Eukaryota. Based on the tree, why do some scientists argue for so many kingdoms?

a) Protists represent a polyphyletic group, so they should not be grouped together.

b) Protists are a paraphyletic group and modern systematics is usually based on monophyletic groups.

c) Some protists are more closely related to the archaea and bacteria making them a polyphyletic group.

d) Protists are a monophyletic group but do not represent a true clade according to modern classification.