

How to Make a Cladogram

Objectives: The student will learn how a cladogram illustrates an evolutionary hypothesis and makes predictions about evolutionary events. (i.e. the scientific method). The student will learn how cladograms depict relationships between taxa, and represent a "family tree" of life. The student will learn how to construct a cladogram from morphological data

Background:

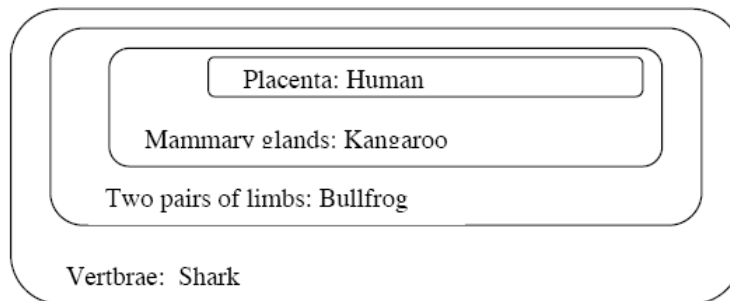
Cladograms are diagrams which depict the relationships between different groups of taxa called "clades". By depicting these relationships, cladograms reconstruct the evolutionary history (phylogeny) of the taxa. Cladograms can also be called "phylogenies" or "trees". Cladograms are constructed by grouping organisms together based on their shared derived characteristics.

Example:

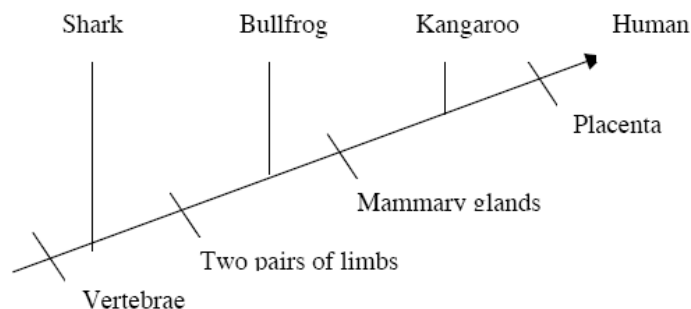
- Given these characters and taxa:

Characters	Taxa			
	Shark	Bullfrog	Kangaroo	Human
Vertebrae	X	X	X	X
Two pairs of limbs		X	X	X
Mammary glands			X	X
Placenta				X

- Draw a Venn diagram. Start with the character that is shared by all the taxa on the outside. Inside each box, write the taxa that have only that set of characters.



- Convert the Venn diagram into a cladogram like so:



Cladogram Worksheet

Procedure:

Step 1 . Using your textbook and the explanations below, determine which of the characteristics each animal has. In the Data Table provided, place an "x" in the box if the animal has the characteristic.

Explanations of Characteristics:

Set #1: Dorsal nerve cord (running along the back or "dorsal" body surface)
 Notochord (a flexible but supporting cartilage-like rod running along the back or "dorsal" surface)

Set #2: Paired appendage s (legs, arms, wings, fins, flippers, antennae)
 vertebral column ("backbone")

Set #3: Paired legs

Set #4: Amnion (a membrane that holds in the amniotic fluid surrounding the embryo; may or may not be inside an egg shell)

Set #5: Mammary glands (milk-secreting glands that nourish the young)

Set #6: Placenta (structure attached to inside of uterus of mother, and joined to the embryo by the umbilical cord; provides nourishment and oxygen to the embryo)

Set #7: Canine teeth short (same length as other teeth)
 Foramen magnum forward (spinal cord opening, located forward, under skull)

Data Table

		Animals						
SETS	TRAITS	Kangaroo	Lamprey	Rhesus Monkey	Bullfrog	Human	Snapping Turtle	Tuna
SET 1	Dorsal Nerve Cord Notochord							
SET 2	Paired Appendages Vertebral column							
SET 3	Paired legs							
SET 4	Amnion (Amniotic sac)							
SET 5	Mammary Glands							
SET 6	Placenta							
SET 7	Canine teeth short Foramen magnum fwd							
	TOTALS of Xs----->							

Step 2: Venn Diagram

Step 3: Draw a cladogram to illustrate the ancestry of these animals.