**Dichotomous Keys Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_**

**Salamanders and Dichotomous Keys:** Knowing the similarities and differences in organisms can help not only to figure out their phylogeny (evolutionary history), but also to help sort and identify them. Suppose you find a large colorful wildflower while walking through the woods. Chances are the flower has already been named and classified, but how can you learn its identity? As an aid to help others identify unknown organisms biologists have developed classification keys. Classification keys have been developed for wildflowers and many other kinds of plants and animals.

Although these keys may vary in purpose and complexity, they have certain features in common. The word dichotomous comes from the word dichotomy, meaning “two opposite parts or categories.” A dichotomous classification key presents the user with two opposite statements about some trait or characteristic of an organism. By choosing the statement that best describes the unknown organism the user is led to further pairs of statements. By going from one set of statements to another, the name of the organism or its classification group is finally determined.

Use a classification key to identify several salamanders. Read statements 1a and 1b in the classification key in Figure 2. One of these statements describes salamander 1; the other statement does not. Follow the directions in the statement that describes salamander 1 and continue following the correct statement directions until salamander 1 has been identified.

|  |  |  |
| --- | --- | --- |
| 1 | **a** Hind limbs absent | *Siren intermedia,* siren |
| **b** Hind limbs present  | Go to 2 |
| 2 | **a** External gills present in adults | *Necturus maculosus,* mud puppy |
|  | **b**  External gills absent in adults | Go to 3 |
| 3 | **a** Large size (over 9 cm long in Figure 1) | Go to 4 |
|  | **b** Small size (under 9 cm long in Figure 1) | Go to 5 |
| 4 | **a** Body background black, small round white spots irregular in size and shape completely covering body and tail | *Ambystoma tigrinum,* tiger salamander |
|  | **b** Body background black, small round white spots in a row along each side from eye to tip of tail | *Ambrstoma maculatum,* spotted salamander |
| 5 | **a** Body background black with white spots | Go to 6 |
|  | **b** Body background light color with dark spots and/or lines on body | Go to 7 |
| 6 | **a** Small white spots on a black background in a row along each side from head to tip of tail | *Ambystoma jeffersonianum,* Jefferson salamander |
|  | **b** Small white spots scattered throughout a black background from head to tip of tail | *Plethodon glutinosus,* slimy salamander |
| 7 | **a** Large irregular black spots on a light background extending from head to tip of tail | *Ambystoma opacum,* marbled salamander |
|  | **b** No large irregular black spots on a light background | Go to 8 |
| 8 | **a** Round spots scattered along back and sides of body, tail flattened like a tadpole | *Triturus viridescens,* newt |
|  | **b** Without round spots and tail not flattened like a tadpole | Go to 9 |
| 9 | **a** Two dark lines bordering a broad light middorsal stripe with a narrow median dark line extending from the head onto the tail | *Eurycea bislineata,* two-lined salamander |
|  | **b** Without two dark lines running the length of the body | Go to 10 |
| 10 | **a** A light stripe running the length of the body and bordered by dark pigment extending downward on the sides | *Plethodon cinereus,* red-backed salamander |
|  | **b** A light stripe extending the length of the body, a marked constriction at the base of the tail | *Hemidactylium scutatum,*  four-toed salamander |



1. Use the dichotomous key for salamanders to identify each of the 11 salamanders, writing both their scientific name and their common name.
2. Remember to write the scientific name in the correct format (Genus species)!

|  |  |
| --- | --- |
| **Scientific Name** | **Common Name** |
| 1. | Slimy salamander |
| 2. |  |
| 3. Ambystoma maculatum |  |
| 4. | Newt |
| 5. |  |
| 6. Necturus maculosus |  |
| 7. |  |
| 8. |  |
| 9. | Red-backed salamander |
| 10. |  |
| 11. Ambystoma opacum |  |

**Beasties Phylogenetic Tree:** A phylogenetic treeis a branching diagram showing the inferred evolutionary relationships among various biological species based upon similarities and differences in their physical and/or genetic characteristics. Even though it may be distantly, the organisms or groups of organisms that are joined together in the tree are implied to have descended from a common ancestor.

Follow the instructions on the heading of each data table on your data collection worksheet to create a phylogenetic tree for Beasties that are pictured below.



**Table 1. Beastie Characteristics** (0 means that it is the trait of the outgroup and 1 means that it is not the trait of the outgroup.)

|  |  |  |
| --- | --- | --- |
| ***Trait*** | ***0 (outgroup)*** | ***1 (not outgroup)*** |
| ***Eye size*** | 0: small | 1: large |
| ***Teeth*** | 0: flat | 1: sharp |
| ***Antenna*** | 0: simple | 1: branched |
| ***Fin*** | 0: absent | 1: present |
| ***Feet*** | 0: round | 1: pointed |
| ***Tail*** | 0: looped | 1: brushy |
| ***Spots*** | 0: absent | 1: present |
| ***Beard*** | 0: absent | 1: present |
| ***Tongue*** | 0: absent | 1: present |

**Table 2. Comparison Data Table** (Fill in with 1’s or 0’s based on the form of the trait possessed.)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Eye size** | **Teeth** | **Antenna** | **Fin** | **Feet** | **Tail** | **Spots** | **Beard** | **Tongue** |
| **Outgroup** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **A** |  |  |  |  |  |  |  |  |  |
| **B** |  |  |  |  |  |  |  |  |  |
| **C** |  |  |  |  |  |  |  |  |  |
| **D** |  |  |  |  |  |  |  |  |  |
| **E** |  |  |  |  |  |  |  |  |  |
| **F** |  |  |  |  |  |  |  |  |  |

**Table 3. Ranked Data Table** (Place the Beasties in order based on the number of differences with the outgroup.)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Eye size** | **Teeth** | **Antenna** | **Fin** | **Feet** | **Tail** | **Spots** | **Beard** | **Tongue** |
| **Outgroup** |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |

**Figure 1. Beastie Phylogenetic Tree** (Fill in the letters of the Beasties on the phylogenetic tree in the boxes and label the cross marks with traits that are shared by all Beasties following that point in the tree!)

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**Constructing a Dichotomous Key**

1. Use your data regarding the characteristics present/absent in Beasties to construct your own dichotomous key.
2. Remember that a dichotomous key includes pairs of opposing descriptions. At the end of the descriptions, the key should either identify the organism for you or lead you to another pair of opposing descriptions.
3. The pictures of Beasties and Table 3 that you used to construct your phylogenetic tree will probably be the most helpful in creating a Beasties dichotomous key!