INTRODUCTION TO VERTEBRATES & TAXONOMIC KEYS
Biol. 452 - Vertebrate Zoology

The classification of organisms into groups is known as **biological taxonomy**. The value of a classification system is that it allows biologists to discern relationships between different organisms. Classification of organisms is a pursuit that has preoccupied naturalists and biologists for millennia. Today, biologists place organisms within a system of groupings, or **taxa** (kingdom, phylum, class, order, family, genus and species), which reflect their perceived evolutionary (or **phylogenetic**) relationships. An outgrowth of a classification system is a **taxonomic key**, which is a tool used to identify organisms. Taxonomic keys can commonly be found in "field guide" books used widely by amateur and professional naturalists to identify fish, amphibians, birds, reptiles, and mammals. In this lab exercise you will employ the mental skills that biologists use when they classify organisms and produce your own classification system and taxonomic key for a variety of organisms.

LAB GOALS
Understand how to write and how to use taxonomic keys to correctly identify an unknown specimen.

LAB ASSIGNMENT
Each group will turn in a ONE taxonomic key along with their table of traits, NEATLY and CLEARLY written, at the end of the lab.

USEFUL READING
Pough, F.H., C.M. Janis, J.B. Heiser, 2009 Vertebrate Life, 8th ed.: Chapter 1, pg. 1-15.

LAB RULES
1. Handle specimens carefully and with respect. Replacing them would require the killing of additional animals.
2. Place 1 "wet" specimen in a tray at a time. Keep the jar in front of you, so you can return it to the correct jar.
3. DO NOT LEAVE "wet" specimens out in an examination tray. They dry out quickly and become useless.
4. Specimens should be picked up by the center of the body. NEVER pick them up by legs, tail, head, fins, or wings only. These parts are fragile and may easily break!!
    a. Bird skins are placed on their backs.
    b. Mammal skins are placed on their stomachs.
5. NEVER touch ANY specimens with a pen or pencil. Use probes as needed.
6. Specimens will usually be laid out in a specific order. Return specimens to their correct location after your examination.

ADDITIONAL INFORMATION

Aberdeen University. 2005. Interactive Game to Make a Key. Virtual Museum of Taxonomy.
http://www.abdn.ac.uk/%7Enhi708/laboratory/key.html

Biology Corner. 2006. Interpreting Graphics – Taxonomy. http://www.biologycorner.com/worksheets/taxonomy_interpret.html

Laboratory for Environmental Biology. 2006. Introduction to Taxonomic Keys. Centenial Museum, Univ. of Texas at El Paso.
http://www3.utep.edu/LEB/keys/keyintro.htm

McGraw Hill Higher Education. 2001. Taxonomic classification & phylogenetic trees. Preview of Concepts. Integrative Biology.
http://www.mhhe.com/biosci/pae/zoology/cladogram/

Utah State Office of Education. 2003. Using a taxonomic key. Utah State 7th Grade Sci-ber Text.
http://www.usoe.k12.ut.us/curr/Science/sciber00/7th/classify/sciber/taxokey.htm

Writing A Taxonomic Key: Team Project

A taxonomic key is a tool that is used to identify different types of organisms. A taxonomic key contains a series of statements that describe the traits of the organisms. The statements are grouped into 2 alternative descriptions (such as 1a and 1b) for each trait. You must be able to recognize the traits described in the key, so as we study each group of vertebrates you will need to learn some terminology that describes external anatomy. When the description in the key and trait of the organism match, you are instructed to proceed to another set of descriptions. Correctly following the steps of the key eventually leads to identification of the unknown organism.

Many taxonomic keys follow a conventional **dichotomous** arrangement so that at each step or couplet one of two choices can be made (A or B). For example the start of a key to the skulls of mammals might look like this:

1A	Canines present	2
1B	Canines absent	3
2A	Forelimbs modified as wings	Order Carnivora
2B	Forelimbs are not wings	Order Chiroptera
3A	Ever-growing incisors present	4 - key keeps going
3B	Upper incisors absent or not ever-growing	5 - key keeps going

If your specimen fits the description in 1A, you proceed to couplet 2A &B. If the specimen fits the description for 1B, you go to the couplet labeled 3A & 3AB. This process continues until the specimen has been identified. Often several characteristics, separated by semicolons or commas are provided with each choice in a couplet. The most diagnostic characteristic, or the characteristic most easily determined, is usually placed first in the arrangement. Although greater reliance can usually be placed on the first characteristic given in a statement, you should read the entire couplet before you make a decision. A hasty decision at any couplet can easily result in improper identification, as many species show much variation for some of the characteristics listed.

Generally, characteristics used in keys pertain to adult forms. Some taxa go through larval stages & have a dramatic metamorphosis; in other species color patterns vary between juveniles & adults. In these cases you may need separate keys for the identification of young forms. Keys are often intended for the identification of living or fresh specimens. Alcohol preserved specimens can be identified with these keys, but many of the characteristics pertaining to color & markings are then of limited use.

An important part of identification is the verification of your final determination from the key, comparing the specimen with an illustration and the list of distinguishing characteristics provided in one of the field guides. Keep in mind that a specimen may not look exactly like the photo, even if identification is correct. Body size, color & other characteristics can change greatly with age, sex, season, locality and other factors. Thus keys must focus on traits that can be used to recognize a taxon at any age, or clearly specify that the key be designed for juveniles or adults.

DEVELOPING YOUR OWN TAXONOMIC KEY

Students at each of the 3 tables should create a key for the group of specimens they have. There are many acceptable ways of grouping the organisms in a key, so don't worry that you might not be doing it the "right" way.
Just make careful observations and use logic and consistency in your classification of the organisms.
Use the illustrations provided with each group of specimens to learn the terms for traits you might use.
Identify only those traits that you believe will be most useful criteria for classification. You don't need to use all of the visible traits.

WRITING YOUR KEY

1. You should use the minimum of distinguishing characteristics in your key.
2. Use traits that are readily recognized or distinct, don't have a vague couplet that presents a difficult choice for the user.
    a. Example: "Has long limbs" or "short limbs" assumes knowledge about possible sizes.
3. Don't use decisions that require comparison of the specimen with other species. Assume that the key user doesn't have other specimens, and that if he had any he wouldn't know what they were.
4. Colors & sizes may vary widely between individuals or sexes; moreover, if the specimen is preserved, its color may be lost.

TESTING YOUR KEY

When you have a taxonomic key completed, teams will rotate & attempt to use the keys developed by another group of students.

CONVERT CLADOGRAM INTO A KEY

Work in teams to create a taxonomic key using the information in the cladogram on pg. 12 of your text. We'll have you write this out on the white boards to share. We'll divide you into sections so each group does part of the total.

Lizards & Snakes: Focus on shapes of scales (dorsal & ventral on body), presence of eyelids, ear canals...

Species	Traits shared by 2 or more species:	Unique feature(s) of each species:
Glass Lizard		
Skink		
Alligator Lizard		
Boa		
Chameleon		

Create your own key here:

1A		
1B		
2A		
2B		
3A		
3B		
4A		
4B		
5A		
5B		

Birds: Focus on beak shapes, claws vs. webbing, feathering on legs, leg lengths

Species	Traits shared by 2 or more species:	Unique feature(s) of each species:
Horned Puffin		
Great Horned Owl		
American Coot		
Rough-legged hawk		
Bonaparte's Gull		

Create your own key here:

1A		
1B		
2A		
2B		
3A		
3B		
4A		
4B		
5A		
5B		

Mammals: Focus on tail lengths, ear lengths, fur on feet, claws...

Species	Traits shared by 2 or more species:	Unique feature(s) of each species:
Pocket Mouse		
Kangaroo Rat		
Pocket Gopher		
Jumping Mouse		
Townsend's Vole		

Create your own key here:

1A		
1B		
2A		
2B		
3A		
3B		
4A		
4B		
5A		
5B		