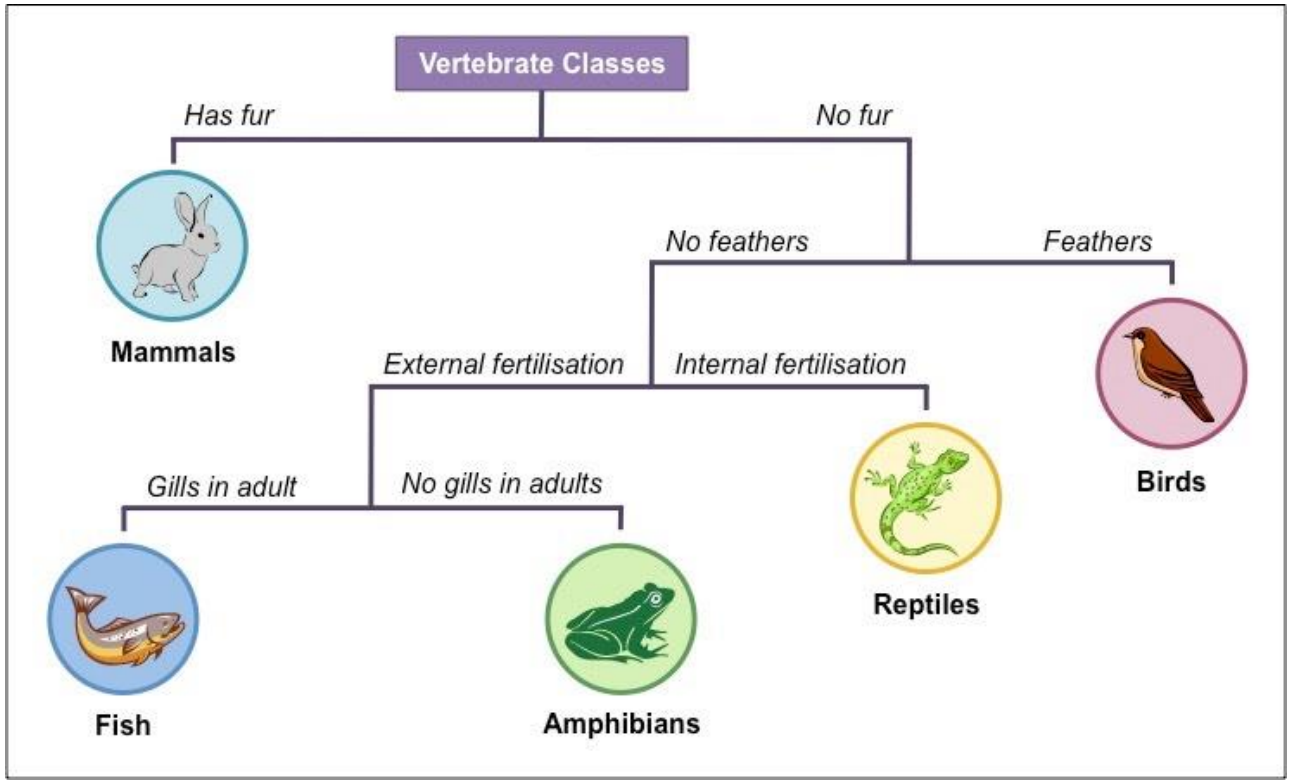
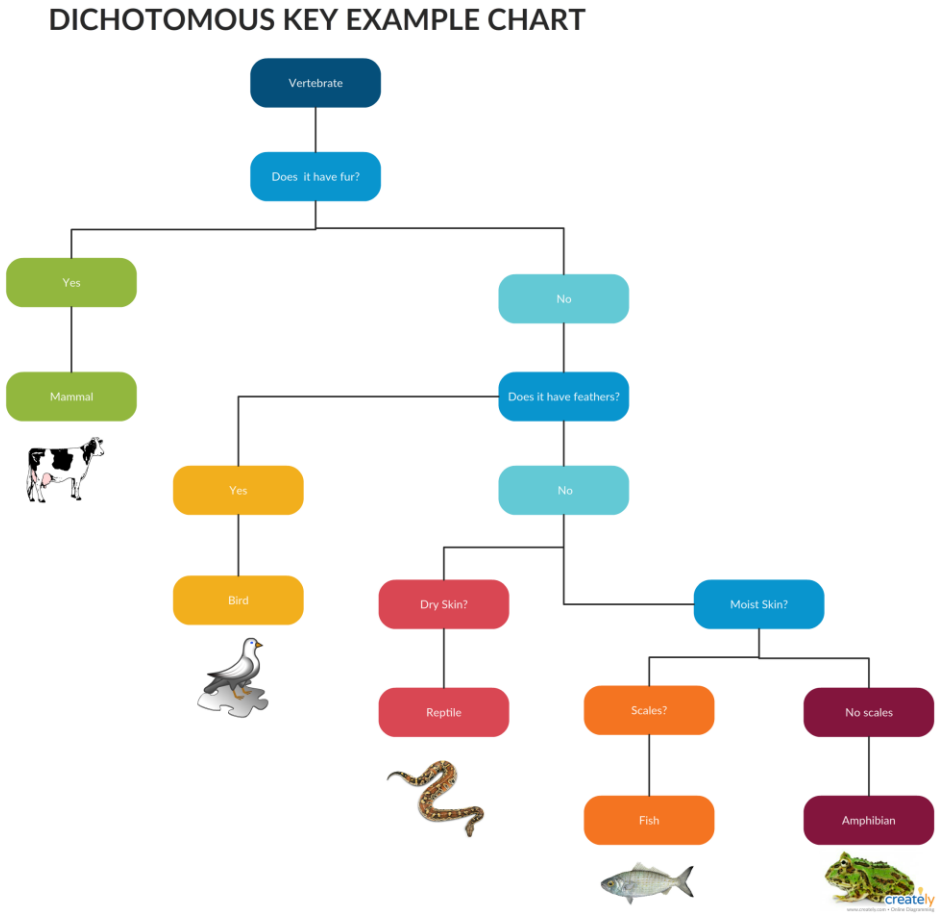
Types of taxonomic keys, their merits and demerits





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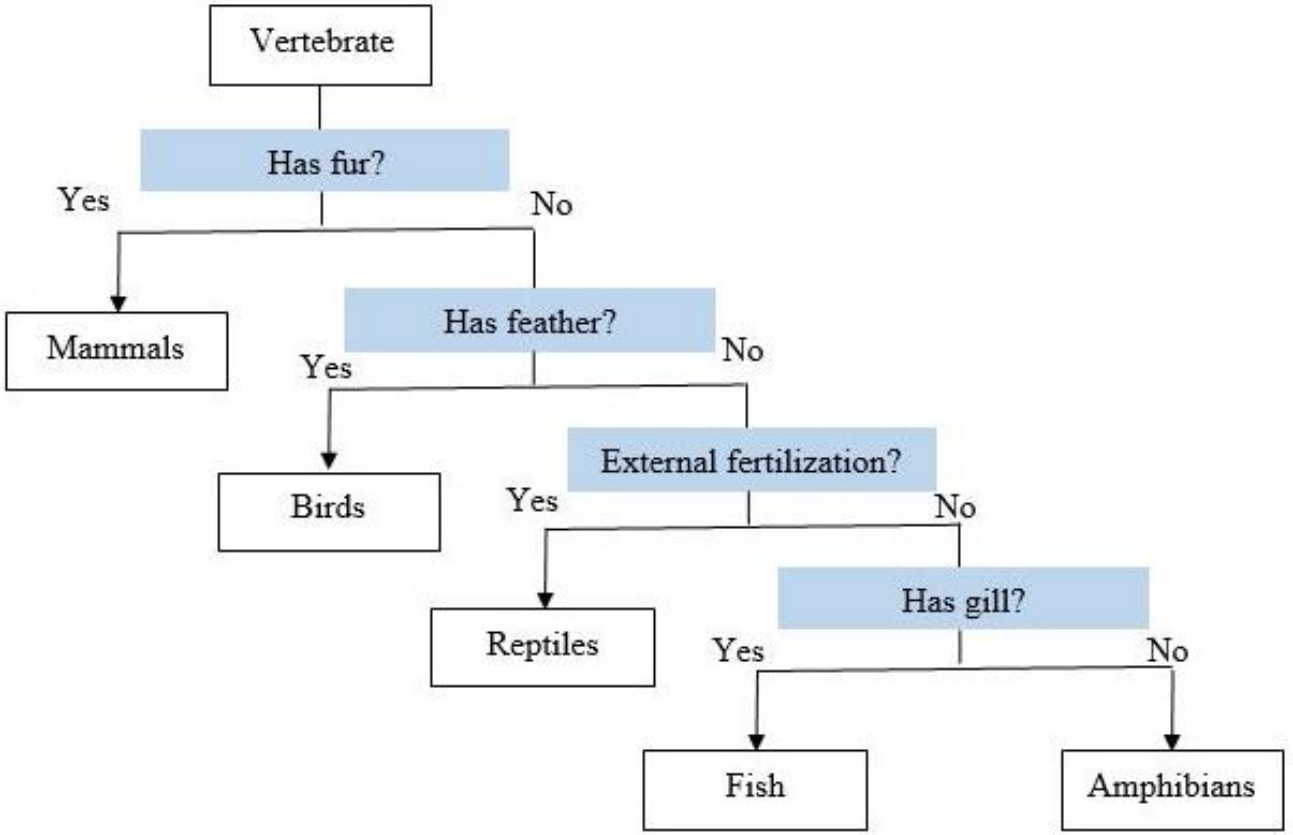
Meaning of Taxonomic Key

- A key is a device, which when properly constructed and used, enables a user to identify an organism.
- Keys are devices consisting of a series of contrasting statements which is requiring the identifier to make judgments and decisions based on statements in the key as related to the material to be identified.
- Thus, a taxonomic key is a device for quickly and easily identifying to which species an unknown plant or animal belongs.

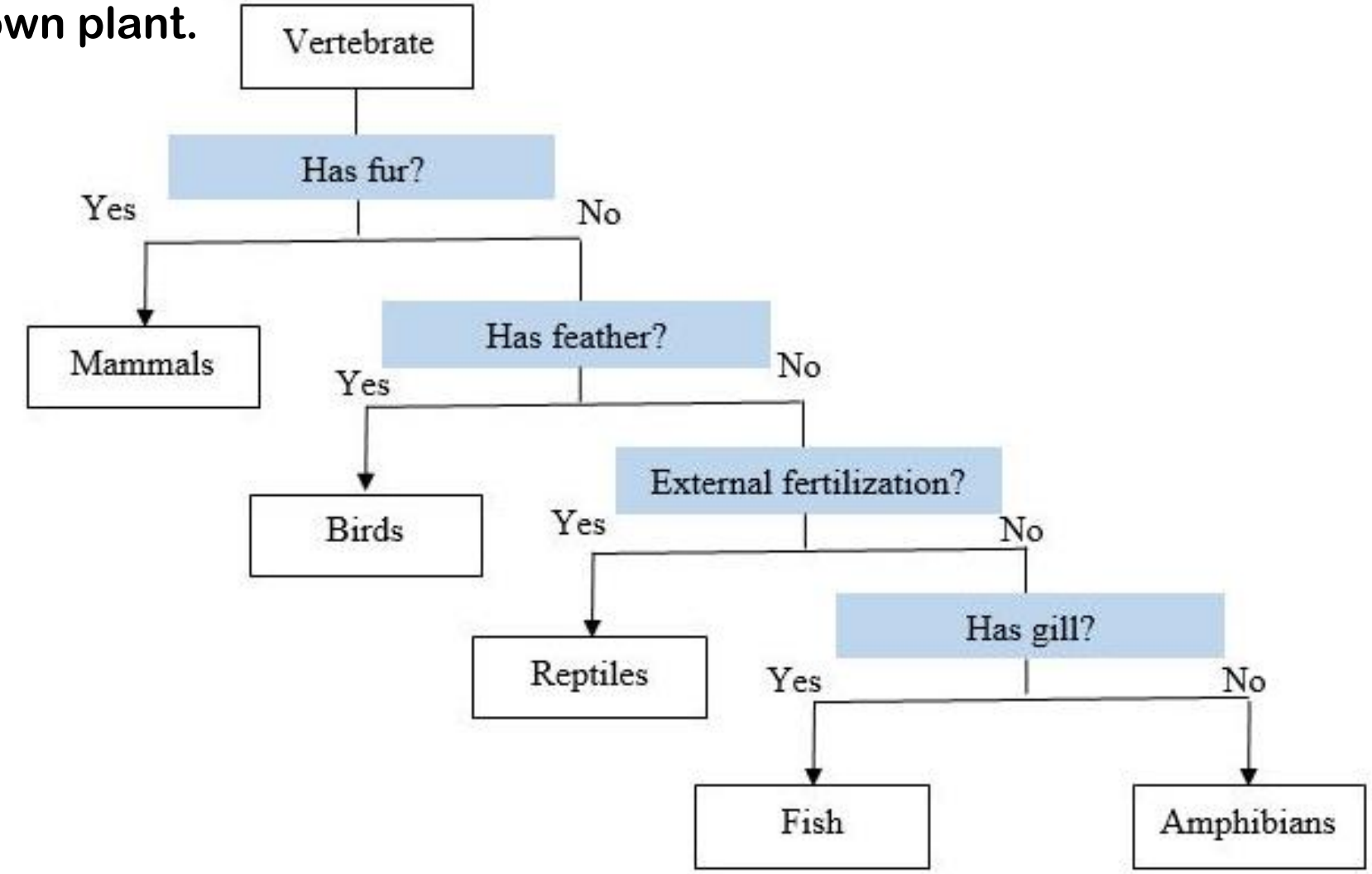
Taxonomic Key

- The key consists of a series of choices, based on observed features of the plant or animal specimen.
- It provides a choice between two opposing statements resulting in the acceptance of one and the rejection of the other.
- A single pair of opposing statements is called a couplet and each statement of a couplet is termed a lead.



Taxonomic Key

- By making the correct choice at each level of the key, one can eventually arrive at the name of the unknown plant.



Suggestions for the Use of Taxonomic Keys

- (a) Appropriate keys should be selected for the materials to be identified. The keys may be in a fauna, manual, guide handbook, monograph, or revision. If the locality of an unknown animal is known, a fauna, guide, or manual treating the animals of that geographic area may be selected.

- (b) The introductory comments on format details, abbreviations, etc. should be read before using the key.

- (c) A glossary should be used to check the meaning of terms, which one does not understand.

Suggestions for the Use of Taxonomic Keys

- (D) The results should be verified by reading a description, comparing the specimen with an illustration or an validly named specimen.

Suggestion for Construction of Taxonomic Keys

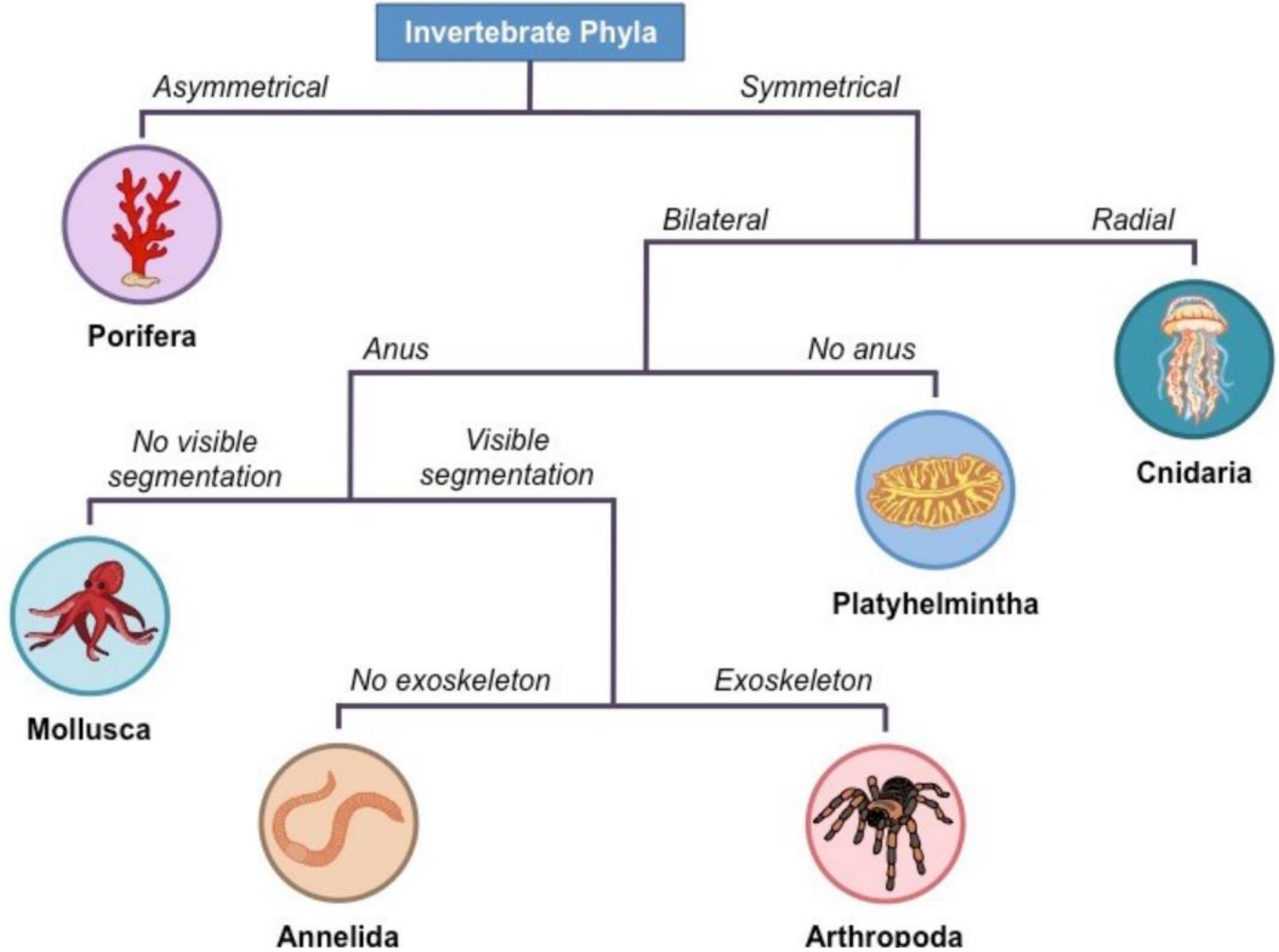
- (a) Constant characteristics rather than variable ones should be used.
- (b) Proper measurements rather than terms like “large” and “small” should be used.
- (c) Characteristics that are generally available to the user of the key rather than seasonal characteristics or those seen only in the field should be used.
- (d) A positive choice should be made. The term “is” instead of “is not” should be used.

Types of Taxonomic Keys

- There are two types of keys:
  1. Dichotomous Key
  2. Poly clave (also called Multiple Access or Synoptic)

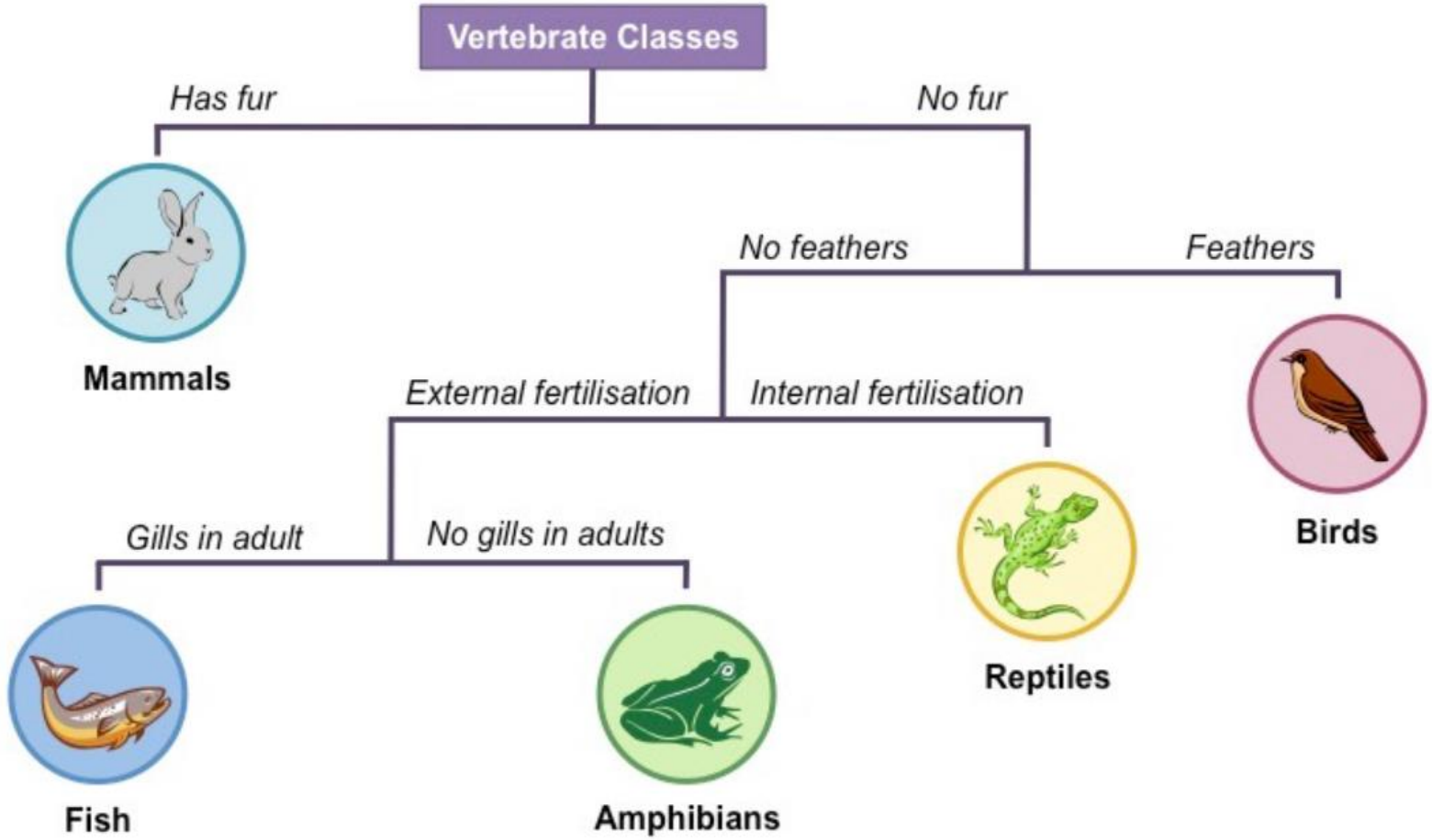
1. Dichotomous Keys

- Keys in which the choices allow only two (mutually exclusive) alternative couplets are known as dichotomous keys.



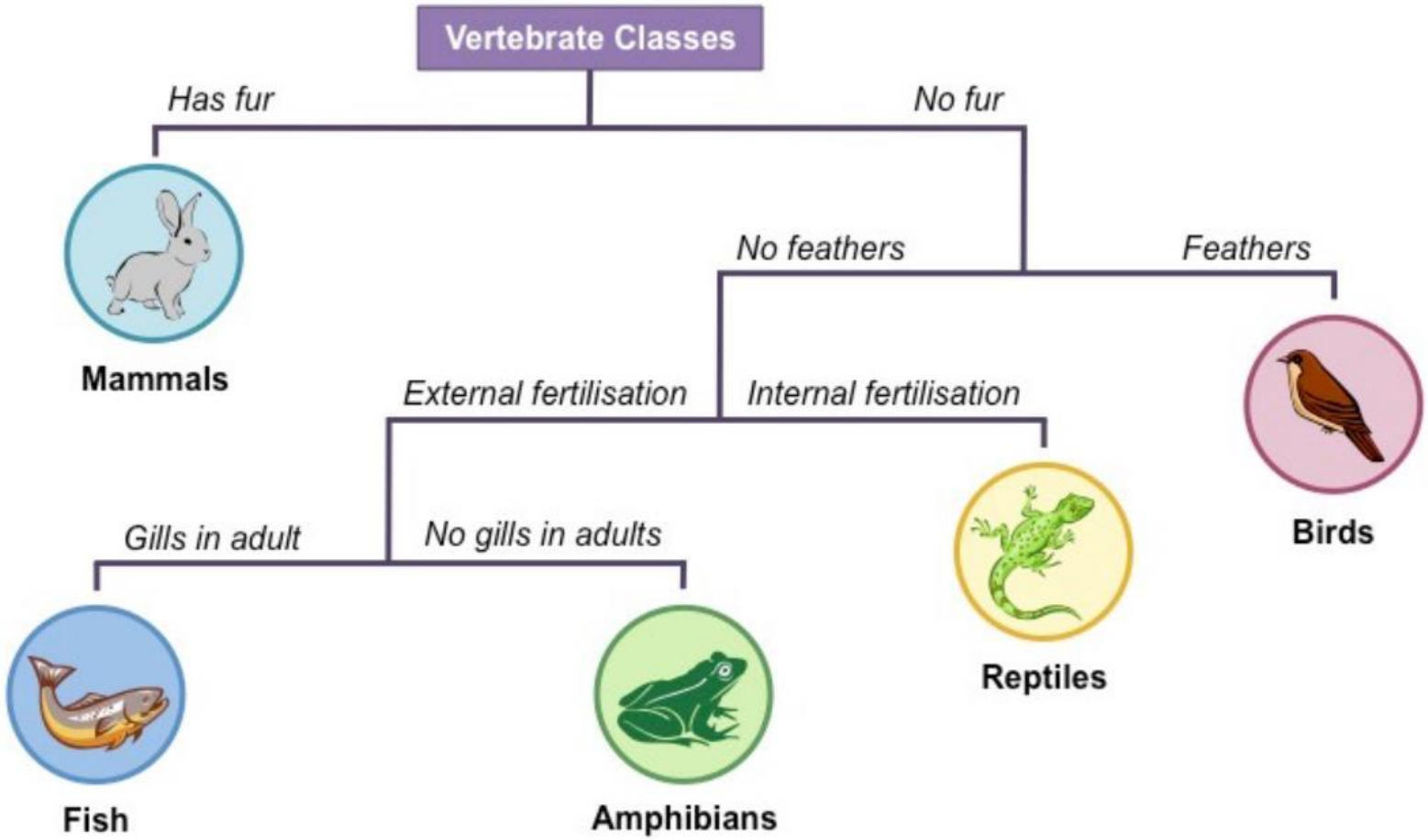
1. Dichotomous Keys

- In constructing a key, contrasting characters are chosen that divide the full set of possible species into smaller and smaller groups i.e. the statements typically begin with broad characteristics and become narrower as more choices are required.



1. Dichotomous Keys

- Each time a choice is made, a number of species are eliminated from consideration and the range of possible species to which the unknown specimen may belong is narrowed. Eventually, after sufficient choices have been made, their range reduces to a single species and the identity of the unknown Animal is revealed.



1. Dichotomous Keys

- Dichotomous comes from the Greek root dich meaning “two” and temnein meaning “to cut“.
- Couplets can be organized in several forms. The couplets can be presented using numbers (numeric) or using letters (alphabetical).

Example of a numerical key with couplets
1. Seeds round—soybeans 1. Seeds oblong go to—2 2. Seeds white—northern beans 2. Seeds black—black beans
Example of an alphabetical key with same couplets
A. Seeds oblong go to—B B. Seeds white—northern beans B. Seeds black—black beans A. Seeds round—soybeans
(*Courtesy:* Constructing a Dichotomous Key, Theodore M. Sperry Herbarium, Department of Biology, Pittsburg State University, Pittsburg, Kansas 66762)

- The couplets can be presented together or grouped by relationships.
- There is no apparent uniformity in presentation of dichotomous keys.

Types of Dichotomous Keys

- There are two types of dichotomous keys. They differ in the method by which the couplets are organized and how the user is directed to successive choices.

- **(i) Indented Keys (also called yoked):**
  - Indents the choices (leads) of the couplet an equal distance from the left margin.
  - The two choices of the couplet are usually labelled 1 and 1′ or la and lb.
  - It is not necessary that the choices are numbered, but it helps.
  - The user goes to the next indented couplet following the lead that was selected.

Example of an Indented Key on *Rhododendron*

1a. Flowers in shades of red
  2a. Flowers blood-red, leaves oblong-ovate, leathery and thick matty texture ..... *R. sikkimense*
  2b. Flowers crimson-red, leaves broad, oval to elliptic oblong, shiny green above ..... *R. fulgens*
1b. Flowers in shades of rose-pink
  3a. Calyx 3-5 mm long, leaf under surface covered with tufts of brown hair ..... *R. wallichii*
  3b. Calyx obscure, 1-2 mm long, leaf under surface covered with continuous indumentum
    4a. Corolla in shades of deep rose-pink flushed externally with red-purple, young leaves aeruginose, leaf margins inrolled ..... *R. aeruginosum*
    4b. Corolla pale lavender blue, mauve or rose-purple, rarely white, young leaves not aeruginose, leaf margins not inrolled ..... *R. campanulatum*

Types of Dichotomous Keys

- **(ii) Bracketed Keys**
  - Provides both choices side-by-side.
  - The choices of the couplet must be numbered (or lettered).
  - It is very helpful if the previous couplet is given.
  - This key has exactly the same choices as the first example.
  - The choices are separated, but it is easy to see the relationships.
  - While this key might be more difficult to construct, it gives more information to the user.

Example of a Bracketed Key on *Rhododendron*

1a.	Flowers in shades of red	go to 2
1b.	Flowers in shades of rose-pink	go to 3
2a.	Flowers blood-red, leaves oblong-ovate, leathery and thick matty texture	*R. sikkimense*
2b.	Flowers crimson red, leaves broad, oval to elliptic oblong, shiny green above	*R. fulgens*
3a.	Calyx 3-5 mm long, leaf under surface covered with tufts of brown hair	*R. wallichii*
3b.	Calyx obscure, 1-2 mm long, leaf under surface covered with continuous indumentum	go to 4
4a.	Corolla in shades of deep rose-pink flushed externally with red-purple, young leaves aeruginose, leaf margins inrolled	*R. aeruginosum*
4b.	Corolla pale lavender blue, mauve or rose-purple, rarely white, young leaves not aeruginose, leaf margins not inrolled	*R. campanulatum*

Problems using Dichotomous Keys

- I. The key may not include all potential variations in the species;
- II. The key may rely on features not present in that season;
- III. The key may not include “all” species of interest;
- IV. One may misinterpret a feature or make a mistake.

2. Poly Clave Keys

- Another type of key, which is relatively a new alternative to dichotomous keys and becoming increasingly popular, especially because of the ease of computerizing them, is termed multiple access or poly clave or synoptic key.
- The advantage of these keys is that they allow the user to enter the key at any point.
- This key is based on the identification of organisms by a process of elimination.
- In a written poly clave key there is a series of characters and character states.
- Each state is followed by a number or code for the species that possess that feature.

2. Poly Clave Keys

- The user needs to select any character and then copy down the list of species that possess the feature.
- Then the user has to select another character and eliminate any species that is not common to both lists.
- This process has to be continued until the specimen is identified.

An example of a Poly clave key

Poly clave Key to Pollination Type

- Pollination is the process of transferring pollen from one flower to another.
- Since plants can't move, they utilize vectors such as wind, water and animals to accomplish this process for them.
- Flowers are specialized by shape, color, door, nectar etc. in order to maximize the chance that a certain vector will accomplish pollination. These flower adaptations are collectively known as pollination syndromes or systems.
- Plants differ in the degree of their specialization for a particular pollination system. For example, many orchids are pollinated by only a single type of bee.

An example of a Poly clave key

Poly clave Key to Pollination Type

- Other flowers are not as specialized and may be pollinated by a variety of bees or perhaps beetles.
- In other cases, insects may visit flowers without actually transferring pollen.
- These factors make it difficult to determine with absolute certainty the pollination system by the poly clave key.

To illustrate how to use a polyclave key, let's determine the pollination system of a dandelion	
1. Select any one of the FLOWER CHARACTERS in the key. Note : you can choose the characters in any order(i.e., multi - entry)	Let's choose FLOWER COLOR
2. Choose the character state (description) that matches the flower you are observing	Dandelions are Yellow
3. Write down the possible pollination systems for this feature	BE,BU,BI
4. Select another feature	NECTAR
5. Choose the character state description that matches your flower	b. present...WI,FM,BE,BA
6. Eliminate from the first character state selected the pollination systems not found on both lists. Continue this process until the pollination system is identified. Note: in some cases it will not be possible to narrow the choices to just one	BE,BU,BI Thus, dandelions are bee pollinated

[*Courtesy :* Plant Taxonomy – Stephen G. Saupe, Biology Department, College of St. Benedict/St. John's University, Collegeville, MN 56321]

Advantages of Poly clave Keys:

The advantages of a poly clave (multiple access) key are:

- I. They are easy to use.
- II. They allow multi-entry i.e. the user can start anywhere. This is a significant advantage because the user can rely on characters that are most easy to observe, rather than having to deal with characters that may not be present in the specimen or are poorly developed.
- III. They are order-free i.e. the user can work in any direction with any character.
- IV. They are faster.

Advantages of Poly clave Keys:

The advantages of a poly clave (multiple access) key are:

- V. They are easily computerized. In fact, these keys are most commonly used in this form. Paper versions are typically large and unwieldy because each character needs to list all possible taxa.

Suggestions to use a Poly clave Key

- I. Read through the list of characters to become familiar with the possibilities.
- II. Scan the list to find a character with a state that you observe in your specimen. Start with a readily identifiable character that has only a few numbers (taxa) associated with it.
- III. Write a brief description of the character and state and the numbers of the taxa that can be described by this state.
- IV. Choose another character and state that describes your taxa. Write a brief description of this state below the name of the first state chosen. Then, scratch off the original list of any taxon that doesn't appear in the second.

Suggestions to use a Poly clave Key

- V. Continue this process until just one taxon remains for all of the states. If there is no single taxon described by the states chosen, and two or more remain, go back and check for errors.

- VI. Read the name of the taxon after its number in the list of taxa. Check your identification with a description in a manual or the herbarium