# 6. Biological Nomenclature

**Introduction**

* Giving name to organisms/taxa is as old as human language
* As folk taxonomy grew to the science of taxonomy, different taxonomic names were given to a taxon (resulted in confusion).
* Then, came the time when codes (rules) of naming of organisms (biological nomenclature) are needed.
* **Common /vernacular names**: depend on local language & vary from area to area.
* There is no code/rule for giving common names**.**
* **Scientific name:** is a global system & uniquely denotes particular organisms.
* Giving scientific names (biological nomenclature) involves formal rules (codes)

**6.1 The Codes of Nomenclature**

* **Biological Nomenclature:** system of principles, procedures and terms related to naming organisms
* **Nomenclatural codes**/**codes of nomenclature**: various rulebooks that govern biological nomenclature
* Criteria /internationally accepted codes for formally naming:
1. **land plants, algae and fungi** = based on the rules and recommendations of ICBN:
2. **cultivated plants =** International Code of Nomenclature for Cultivated Plants (ICNCP);
3. **animals =** is International Code of Zoological Nomenclature or ICZN;
4. **prokaryotes or bacteria =**  International Code of Nomenclature of Bacteria or ICNB; and
5. a draft code for naming **Viruses.**
* All codes are independent and continuously modified from time to time.

**6.2 Botanical Codes and Its Operative Principles**

* ICBN is organized into a number of rules (mandatory & written as articles), notes, recommendations and explanatory examples and footnotes.
* ICBN can only be changed by **International Botanical Congress (IBC),** with the International Association for Plant Taxonomy providing the supporting infrastructure
* first set of international rules governing the naming of plants was created at the second International Botanical Congress in Vienna in 1905= **Vienna Rules**
* IBC have produced revised versions of the Rules of Botanical Nomenclature which later on called the **ICBN.**

Table: Subsequently revised versions of Botanical Nomenclatural Rules or Code

|  |  |  |  |
| --- | --- | --- | --- |
| **Year of adoption** | **Informal name** | **Year of adoption** | **Informal name** |
| 1905 | Vienna Rules | 1981 | Sydney Code |
| 1935 | Cambridge Rules | 1987 | Berlin Code |
| 1952 | Stockholm Code | 1993 | Tokyo Code |
| 1969 | Seattle Code | 2005 | Vienna Code |
| 1975 | Leningrad Code | 2011 | Melbourne Code |

* **Basic Activities of ICBN**
* ICBN is utilized in two basic activities:

 (1) naming new taxa, and

 (2) determining correct name for previously named taxa, which may have been divided, united, transferred, or changed in rank.

* **Principles of botanical nomenclature**
	+ - 1. Botanical nomenclature is independent of other codes.
			2. A botanical name is fixed to a taxon by a type: dried plant material & usually deposited & preserved in a herbarium; it may an image/preserved culture.
			3. The nomenclature of a taxonomic group is based upon priority of publication. The first publication of a name for a taxon, but the formal starting date for purposes of priority is 1 May, 1753, the publication of *Species Plantarum* by Linnaeus.
			4. Each taxonomic group with a particular circumscription, position, and rank can bear only one correct name (scientific name), the earliest that is in accordance with the Rules, except in specified cases.
			5. Scientific names of taxonomic groups are treated as Latin regardless of their derivation.
			6. The Rules of nomenclature are retroactive unless specifically limited.

**6.2.1. Scientific names (4th principle)**

* The **fundamental principle of nomenclature** is the fourth principle of the ICBN.
* every taxon, whether species, genus, family, etc., can bear only one **correct** name.
* Names assigned by the rules of the ICBN = **scientific names.**
* Scientific names of species are **binomials**, i.e., composed of two names.

eg. In *Liquidambar* *styraciflua*, *Liquidambar* is genus **name** and is always capitalized & *styraciflua* is the **specific epithet** & written in small letter.

* Binomial species names are always either italicized or underlined. Taxa above the rank of genus are notunderlined or italicized.
* **Ranks of taxa and related terms**
* Some scientific names of a particular rank must end in a certain suffix according to the rules & recommendations of the ICBN. Moreover, a taxon at a particular rank has only one correct name.

e.g. Asteridae is a taxon at the rank of subclass, Asterales is at the rank of order, and Asteraceae is at the rank of family, etc.

* Exception are eight alternativefamily names, none of which end in –aceae: Compositae (for Asteraceae), Cruciferae (Brassicaceae), Gramineae (Poaceae), Guttiferae (Clusiaceae/ Hypericaceae), Labiatae (Lamiaceae), Leguminosae (Fabaceae), Palmae ( Arecaceae), and Umbelliferae (Apiaceae).
* A subspecies/variety name is a **trinomial**; e.g., *Toxicodendron radicans* ssp. *diversilobum* or *Brickellia* *arguta* var. *odontolepis*; **subspecific** **epithet** is *diversilobum* & **varietal epithet** is *odontolepis*.

**Table:** Taxonomic ranks recognized by the ICBN.

|  |  |  |
| --- | --- | --- |
| **No** | **Rank**  | **Standard endings and examples** |
| **Plants** | **Examples** |
| 1 | **Kingdom** | - | **Plantae** |
| 2 | **Division(Phylum)**  | -phyta | Magnoliophyta |
| 3 | Subdivision  | -phytina  | Magnoliophytina |
| 4 | **Class**  | - opsida  | **Asteropsida** |
| 5 | Subclass | - idea | Asteridae |
| 6 | **Order**  | -ales | **Asterales** |
| 7 | Suborder  | -ineae | Asterineae |
| 8 | **Family** | -aceae | **Asteraceae** |
| 9 | Subfamily  | -oideae | Asteroideae |
| 10 | Tribe  | -eae | Heliantheae |
| 11 | Subtribe  | -inae | Helianthinae |
| 12 | **Genus**  | - | ***Helianthus*** |
| 13 | Subgenus  | - | *Helianthus* |
| 14 | Section  | - | *Helianthus* |
| 15 | Series  | - | *Helianthus* |
| 16 | **Species**  | - | ***Helianthus annuus*** |
| 17 | Subspecies (susp., ssp.)  | - | *Helianthus annuus* ssp. *annuus* |
| 18 | Variety (var)  | - | *Helianthus annuus* var. *annuus* |
| 19 | Form (f)  | - | *Helianthus annuus* f. *annuus* |

* **Author of scientific names**
* All scientific names at & below the rank of family have an author, the name of the person who first validly published the name.
* e.g The full name (including authorship) of the family Rosaceae is Rosaceae Jussieu, because de Jussieu first formally named the family;
* Other examples: Conostylideae Lindley, *Mohavea* A. Gray, *Mohavea confertiflora* (Bentham) Heller, etc.
* Author names are often abbreviated, such as Haemodoraceae R. Br. (for Robert Brown) or *Liquidambar styraciflua* L. (L. for Linnaeus).

**6.2.2. Nomenclatural types**

* Scientific names must be associated with some physical entity = **nomenclatural type/** **type**.
* It is almost always a specimen, (e.g. dried plant specimen), but it may also be an illustration
* Acts as a reference for the name, upon which the name is based. If there is ever any doubt as to whether a name is correct or not, the type may be studied.
* The nomenclatural type is not necessarily the most typical or representative element of a taxon.
* Different types of types;
* A **holotype:** one specimen/illustration upon w/h a name is based originally used type.
* Serves as the best reference; holotype should be deposited in an internationally recognized herbarium ( recomendation).
* **Isotype:** duplicate specimen of holotype, collected at same time & by the same person from the same population.
* A **lectotype**: a specimen that is selected from the original material to serve as the type when no holotype was designated at the time of publication.
* A **neotype**: a specimen derived from a non-original collection & selected to serve as the type as long as all of the material on which the name was originally based is missing.
* Type specimen for a genus name = the same as the one for the species within the genus that was published first.
* The type specimen for a family name = same as the one for the genus within the family that was published first.

**6.2.3. Priority of publication (3rd principle of the ICBN)**

* When two or more names compete for a taxon, the one published firstis the correct one, with a few exceptions.
* Priority of publication applies only to taxa at the rank of **family** & **below** and does not apply outside a particular rank (with a transfer in rank).
* **For examaple,** of the two competing names for a genus position (both legitimate & validly published), *Mimulus* (published in 1753) & *Diplacus* (published in 1838), the genus *Mimulus* has priority and is the correct name.
* **Conservation of names**
* Sometimes, in contrary to Priority of publication, well known names will be conserved (to be used) by the IBC over another that actually has priority.
* As three Amendments to ICBN: conservation of family, genus and species names.
* This is to provide greater stability in nomenclature by permitting names that are well known and widely used to persist.
* **Name changes**
* Occasionally, the name of a taxon will change for only two reasons, because of:

(1) the name is contrary to the rules of ICBN (i.e., is illegitimate), and

(2) additional taxonomic study or research/ due to taxonomic **revision/**.

* There are four basic types of nomenclatural activities that can result in a name change.
	+ - * 1. **A single taxon may be divided into two or more taxa,often called *segregate taxa.***
* e.g. the genus *Langloisia* has been split into two genera, *Langloisia* and *Loeseliastrum*, based on a number of morphological, anatomical, and palynological (pollen) features that distinguish them.
* Other examples of taxa being divided are:
* The genus *Carduus* = *Carduus* and *Cirsium;*the genus *Rhus* = *Malosma*, *Rhus*, and *Toxicodendron;* the classical family Liliaceae has been split into = Alliaceae, Hyacinthaceae & Liliaceae.
* When a larger taxon is divided into two or more smaller taxa of the same rank, the terms **sensu lato** (abbreviated **s.l.**) may be used to distinguish the more inclusive taxon; **sensu stricto** (abb. as **s.str.** or **s.s.**) may also be used to distinguish the less inclusive taxon.
* e.g. For example, *Haplopappus* s.l. contains many more species than *Haplopappus* s.s., the latter of which is what remains after *Haplopappus* s.l. is split into many segregate genera.
	+ - * 1. **A second major name change occurs when two/more separate taxa are united into one**.
* In cases of taxa being united, the final name used is that which was **published earliest**
* The term sensu lato (**s.l.)** will be used with the later name to show its inclusiveness.
* e.g. Species *Bebbia juncea* & *Bebbia aspera* were considered indistinct & were united into one species, *B. juncea*

**III**. **Third, a taxon may be transferred in position**, from one taxon to another of the **same rank.**

* eg. The species *Rhus laurina* was transferred in position as a member of the genus *Malosma*, the new species name being *Malosma laurina*

**IV. Fourth, a taxon may be changed in rank**.

* e.g. The species *Eruca sativa* was changed to the rank of subspecies (of the species *E. vesicaria*), the new combination being *Eruca vesicaria* ssp. *Sativa.*
* **Basionym:** the original (but now rejected) name, partof which has been used in a new combination. It is the name-bringing or epithet-bringingsynonym.
* Nameof the author(s) who originally named the basionym isalso retained & placed in parentheses ahead of the authorwho made the change.
* e.g.When *Sedum variegata* **Wats**. was transferred to the genus *Dudleya* by **Moran**, the new species name became *Dudleya variegata* (Wats.) Moran. The original epithet, *variegata*, is retained, and the author associated with that epithet, Watson in this case, is also retained, but is placed in parentheses preceding the new author. The basionym in this case is *Sedum variegata* Wats., the original name.
* **An autonym:** an automatically created name for infrafamilial, infrageneric, and infraspecific taxa. Autonyms are used whenever a family is divided into subfamilies, tribes, or subtribes; a genus is divided into subgenera or sections; or a species is divided into subspecies or varieties.
* Of the two or more sub-taxa formed, the autonym is assigned based on priority, i.e., to the group containing the taxon that was published first.
* Autonyms have no authors; only the higher taxa upon which they are based, and the other sub-taxa have formal authorship. .
* e.g. **Isely** split *Lotus stipularis* (Benth.) E. Greene into two varieties: *L. stipularis* (Benth.) E. Greene var. *ottleyi* **Isely** and *L. stipularis* (Benth.) E. Greene var. *stipularis*.
* N.B: the latter variety, containing the autonym, lacks authorship because its type is the same as that for the originally described species. (This means, as neither the type nor the final epithet has changed; there is no need for a change in author citation).
* For infrafamilial taxa, the autonym has the same root name as the family but a different ending that corresponds to the infrafamilial rank.

Eg. The family **Euphorbiaceae** is usually divided into subfamilies, one of which, the **Euphorbioideae,** is the autonym. This subfamily, of course, contains the genus *Euphorbia*, the type for the family. *Euphorbia* is a type for both **Euphorbiaceae** and **Euphorbioideae.**

* For infrageneric taxa, the autonym is identical to the genus name and should be preceded by the name of the rank to avoid confusion.
* *e.g. Ceanothus* (a genus) consists of two subgenera, subgenus *Ceanothus* & subgenus *Cerastes*. Subgenus *Ceanothus* (an autonym)is the one that includes the type for the genus itself.
* In infraspecific taxa, autonyms are identical to the specific epithet.
* *e.g. Eriogonum* *fasciculatum* is divided into several varieties, one of which, *Eriogonum fasciculatum* var. *fasciculatum*, includes the autonym (and is based on the original type specimen for the species, thus, its author and the author of the species is the same).
* **Valid publication**
* According to the ICBN, in order for a scientific name to be formally recognized, it must be **validly published**. There are four general criteria for valid publication of a name.
1. The name must be **effectively publish:** it must be published in a journal commonly available to botanists.
2. The name must be published in the **correct form** (properly Latinized) and with the rank indicated. Such a **legitimate name** in **correct form** is known as an **admissible name**.
3. The name must be published with a **Latin description** or diagnosis or with a reference to such.
* The Latin description may be brief, e.g., listing how the new taxon is different from a similar, related taxon.
1. For taxa of the rank of genus and below, a **nomenclatural type** must be indicated; the location of this type is also indicated (which lists the names, addresses, and number and types of specimens). The full citation of a scientific name = authorship + the place+ date of publication.
* **Synonyms, homonym and tautonym**
* A **synonym:** a rejected name by a particular author or authors.
* Synonyms are the names replaced by other new names for the same taxa (are rejected names). They may be based on the same or on adifferent type specimen from the correct name.
* A **correct name** is a legitimate (therefore validly published) name that is accepted **by a particular author(s)**. N.B: Each taxon can have only **one correct** name.
* If there are two or more competing names for the same taxon, e.g., *Malosma laurina* (Nutt.) Abrams and *Rhus laurina* Nutt., only one of them can be correct. However, whichname is correct depends on the principles of priority. When one is selected as the correct name, the other will be the **synonym.**
* e.g.Synonyms are typically indicated in brackets followingthe correct name, such as *Malosma laurina* (Nutt.) Abrams[*Rhus laurina* Nutt.] or *Machaeranthera juncea* (Greene)Hartman [*Haplopappus juncea* Greene].
* A **homonym** is one of two (or more) **identicalnames** (not including authorship) that are based on different type specimens.
* The later homonym, based on publication date, is illegitimate (unless it is conserved.
* eg. *Tapeinanthus* Herb. (1837) of the Amaryllidaceae, and *Tapeinanthus* Boiss. ex Benth. (1848) of the Lamiaceae, are homonyms. The later homonym in the Lamiaceae is illegitimate [and was renamed *Thuspeinanta* T. Durand (1888)]
* **Tautonym:** a species names in w /h the **genus** name & **specific epithet** are identical in spelling.
* Tautonyms are not permitted in botanical nomenclature.

e.g. The name *Helianthus helianthus* is a tautonym & illegitimate, whereas *Helianthus helianthoides* is not a tautonym and would be permitted.

**N.B**: Zoological nomenclature does permit tautonyms, as in *Gorilla gorilla*.

**6.2.4. Independence of botanical nomenclature**

* The ICBN is independent of the ICZN and other codes.
* Thus, there may be some names of plants, algae, or fungi that are identical to those of some animals.

e.g. The genus *Morus* refers both to a flowering plant, the mulberry, and to a bird, the gannett; *Ficus* is the genus name of the figs (plant) and of a group of gastropods (animals).

**6.2.5 Retroactivity of the ICBN**

* The Rules of the International Code of Botanical Nomenclature are retroactive, except in specified cases (retroactive application of rules of ICBN unless stated otherwise).

**6.2.6. Treatment of botanical names in Latin Language**

* The fourth principle of the ICBN is that botanical names are treated as Latin, a language chosen because of its classical history (in the past being the language of scholars)
* No matter what the language of the person who published a name, the name itself must consist of direct Latin words or be Latinized
* **Some common usages in ICBN**
* **Commonly used abbreviations**
* Certain abbreviations are used in scientific names.
* The word **ex** means validly published by somebody. e.g. *Microseris elegans* Greene ex A. Gray = Asa Gray validly published the name *Microseris elegans* that was originally proposed (but not validly published by) Greene.
* The ex plus the author(s) **preceding**it may be omitted, as in *Microseris elegans* A. Gray.
* The word **in** means in the publication of, referring to a name published within a larger work authored by the person(s) following the **in**.
* *e.g. Arabis sparsiflora* Nutt. **in** T. & G. means that Nuttall validly published the name *Arabis* *sparsiflora* in another work authored by Torrey & Gray.
* The **in** plus the author(s) **following**it may be omitted as in *Arabis sparsiflora* Nutt. (The use of **in** is not recommended by the ICBN.)
* An **x** indicates a hybrid. e.g. *Salvia x palmeri* (A. Gray) E. Greene is a named (validly published) taxonrepresenting a hybrid between two species: *S. apiana* Jepsonand *S. clevelandii* (A. Gray) E. Greene. Alternatively, this hybridcould be represented as *S. apiana* Jepson × *S. clevelandii* (A. Gray) E. Greene.
* As mentioned earlier, **s.**l.(*sensu lato*) = broad sense = inclusive taxon circumscription, and **s.**str**.** or **s.s.** (*sensu stricto*) = strict sense, referring to a narrow, exclusive taxon circumscription.
* **Gender**
* All Latin words have a gender: masculine, feminine, or neuter.
* Gender determination is usually needed for names at the rank of genus or below.
* The standardized gender endings are:

**Masculine Feminine Neuter**

-us -a -um

-er -ra -rum

-is -is -e

-r -ris -re

* The first row of endings (-*us*, -*a*, and -*um*) are those most commonly used.
* e.g. The gender of the genus *Amaranthus* is masculine, *Crassula* is feminine, and *Polygonum* is neuter.
* Specific or infraspecific epithets are usually adjectives, the endings of which must agree in gender with that of the genus name, as in *Amaranthus albus*, *Crassula connata*, and *Eriogonum fasciculatum* ssp*. polifolium*.
* Note that a **name change** (divided, united, transferred in position, or changed in rank) can necessitate **a change in the gender ending of a specific epithet.**

e.g. For species *Haplopappus squarrosus*, the ending (-*us*) is masculine. When this species is transferred to the genus *Hazardia*, the new name becomes *Hazardia squarrosa*. Although the root of the specific epithet does not change, its ending may, in order to agree in gender with the new genus name.

* **Number**
* Names of genera, infrageneric names (such as subgenera or sections), and species or infraspecific combinations are all treated as singular in Latin.
* All taxon names above the rank of genus are treated as Latin plural nouns.

**6.3.4. Commemoratives**

* Commemorative names are those named after a person or place.
* Specific or infraspecific commemorative names are usually treated as the genitive case (denoting possession) and must have genitive endings.
* For male commemoratives, the ending is (1) -*ii*, if the name ends in a consonant, as in *Isoetes* *orcuttii* (unless the terminal consonant is -*r* or -*y*, in which case a single -*i* is used, as in *Erigeron breweri*; (2) -*i*, if the name ends in a vowel other than *a*, as in *Arctostaphylos pringlei*.
* For male commemorative names that end in -*a* and for all female commemorative names (regardless of ending) an -*e* is added, as in *Baccharis vanessae* or *Carex barbarae*.

## Zoological Codes and Its Relation to ICBN

* ICZN is the second oldest and well recognized international code of nomenclature.
* It rules the formal scientific naming of organisms treated as animals.
* Enables zoologists to determine the valid name for a taxon of an animal
* Basically, content of ICZN are similar to that of ICBN with some notable differences.
* ICZN or ICZN Code rules nomenclature of [organisms](http://en.wikipedia.org/wiki/Organisms) treated as animals.
* The rules principally regulate:
1. how names are correctly established in the frame of [binominal nomenclature](http://en.wikipedia.org/wiki/Binominal_nomenclature),
2. which name has to be used in case of conflicts among various names, and
3. how names are to be cited in the scientific literature.
* Rules and recommendations of ICBN have one fundamental aim: to provide the maximum universality & continuity in the naming of all animals
* The Code guides only the nomenclature of animals, while leaving zoologists freedom in classifying new taxa.
* A new animal name published without adherence to the Code = simply "unavailable" if it fails to meet certain criteria, or fall entirely out of the province of science.
* The rules in the code determine name of any taxon in the [family](http://en.wikipedia.org/wiki/Family_%28biology%29) group, [genus](http://en.wikipedia.org/wiki/Genus) group, and species group.
* It has additional (but more limited) provisions on names in higher [ranks](http://en.wikipedia.org/wiki/Taxonomic_rank). The Code recognizes no case law (law established on the basis of previous verdicts). Any dispute is to be decided first by applying the Code directly, and not by reference to precedent.

### 6.3.1. Principles of ICZN

* ICZN holds by six central principles, which were first set out (as principles) in the third edition (February, 1985) of the Code.
1. **Principle of Binominal Nomenclature**
* Scientific name of a species, and not of a taxon at any other rank, is a combination of two names. ; I.e. name of a species is composed a generic name & a specific name (a " binomen").

 e.g. *Giraffa camelopardalis* is binomial

* The use of a trinomen for subspecies and uninominal names for taxa above the species group is in accordance with this Principle.

e.g. Subspecies have a name composed of three names, a “trinomen": g**eneric name** and **specific name**, s**ubspecific nam**e as in subspecies *Giraffa camelopardalis rothschildi*.

* Taxa at a rank above species have a name composed of one name, a "uninominal name".

eg. Genus *Giraffa* and familiy Giraffidae.

1. **Principle of Priority**
* The correct formal scientific name for an animal taxon is called the **valid name=** the oldest available name that applies to it.
* Starting date for priority of names in zoology is 1758.
1. **Principle of Coordination**
* Within the family group, genus group and species group, a name established for a taxon at any rank in the group is simultaneously established with the same author and date for taxa based on the same name-bearing type at other ranks in the corresponding group.
* e.g. In the **species-group**, publishing a species name (the binomen) *Giraffa camelopardalis* Linnaeus, 1758 also establishes the subspecies name (the trinomen) *Giraffa camelopardalis camelopardalis* Linnaeus, 1758. The same applies to the name of a subspecies; this establishes the corresponding species name.
* In the genus-group, similarly, publishing the name of a genus also establishes the corresponding name of a subgenus (or vice versa): genus *Giraffa* Linnaeus, 1758 and subgenus *Giraffa (Giraffa)* Linnaeus, 1758.
* In the family-group, publication of the name of a family, subfamily, superfamily (or any other such rank) also establishes the names in all the other ranks in the family group.
1. **Principle of the First Reviser**
* In cases of conflicts between simultaneously published names/nomenclatural acts, the first subsequent author can decide which one shall be regarded as the one that should have precedence (priority).
* This first author who cites those names or acts in a published work by selecting from them is termed as the "First Reviser".
* It supplements the Principle of Priority; i.e. the principle of the first reviser deals with situations that cannot be resolved by Principle Priority.

e.g. Linnæus 1758 established *Strix scandiaca* and *Strix noctua* (Aves), for which he gave different descriptions and referred to different types, but both taxa later turned out to refer to the same species, the snowy owl. The two names are subjective synonyms. Lönnberg 1931 acted as First Reviser, cited both names and selected *Strix scandiaca* to have precedence.

1. **Principle of Homonymy**
* Any one animal name, in one particular spelling, may be used only once (Principles of Priority and the First Reviser); the later name with the same spelling is called a [**homonym**](http://en.wikipedia.org/wiki/Homonym_%28zoology%29)**.**
* Name that is a junior homonym of another name must not be used as a valid name.
1. **Principle of Typification**
* Each nominal taxon in the family group, genus group or species group has a name-bearing type
* Any family-group name must have a type genus, any genus-group name must have a type species, and any species-group name can (not must) have one or more type specimens (holotype, lectotype, neotype, syntypes or others), usually deposited in a museum collection.

e.g. The family name Spheniscidae has as its type genus the genus *Spheniscus* Brisson, 1760.

### 6.**3.2. Structure of names and** **Gender agreement**

* The ICZN divides names in the following manner:
* Names above the family group,
* Family-group names
* Genus-group names (the genus and the subgenus), and
* Species-group names (the [species](http://en.wikipedia.org/wiki/Species) and the [subspecies](http://en.wikipedia.org/wiki/Subspecies)).
* The names above the family group are not fully regulated by the code.
* The names in the family group, the genus group and the species group are fully regulated by the provisions in the Code.
* In the species group, gender agreement applies. The names of a species, e.g., *Loxodonta africana*, and of a subspecies, say *Canis lupus albus*, originally are a Latin phrase, and must be grammatically correct Latin.

### N.B: The rules in the Code are to be followed by all users of zoological names. However, its provisions can be interpreted, put aside or modified in their application to a particular case when strict adherence would cause confusion. Such exceptions are made by only by the International Commission on Zoological Nomenclature, acting on behalf of all zoologists. The Commission takes such action in response to proposals submitted to it.

### 6.4. Some Similarities and Difference of ICBN and ICZN

**6.4.1. Shared features of the two codes**

* + The purpose of both codes is to ensure a unique and stable scientific name for every taxon.
* Both provide rules for publication, validation, documentation and typification of names.
* Allow assignment and changes in names without interfering with scientific freedom.
* Commissions provide an administrative system to oversee and interpret rules, but not based on “case law”.

**6.4.2. Some notable differences between the two Codes:**

* **Botanical and zoological codes are independent**: names are not required to be unique, e.g. *Pieris* -butterfly; *Pieris* –heath (a plant genus).
* **Supra-generic name endings and italicization**: similar levels in the hierarchies have different endings, or the same endings may refer to different levels. ICZN italics applied to genus and species ranks only, but the ICBN encourage italicization for all ranks but not mandatory.
* **Ranks covered by ICBN and ICZN:** taxa regulated byICBN and ICZN show some differences as shown in table below.

 **Zoological Code Botanical Code**

(Kingdom) Kingdom

(Phylum) Division or Phylum

(Class) Class

(Order) Order

Family Family

Tribe Tribe

Genus Genus

- Section
- Series

Species Species

- Variety
- Form

[plus sub-categories of all [plus subcategories of all]

and super-categories above Genus]

NB: Zoological taxa in brackets “( )” are not regulated by the zoological code.

* **Infraspecific connecting terms**: such terms are not used by ICZN. In the ICBN, infraspecific connecting terms are used as indicated in the examples below.

e.g. *Saxifraga aizoon* var. *aizoon* subvar. *brevifolia* f. *multicaulis* subf. *surculosa* Engl. and Irmsch.

* **Different terminologies used in the codes include the followings:**

 **Zoological Code Botanical Code**

Junior homonym Later homonym

Objective synonym Nomenclatural synonym

Subjective synonym Taxonomic synonym

 Available Validly published

Valid name Correct name

Specific name Specific epithet

Binomen, name of a species Specific name

* **Priority/Availability/Validity**: mostly, these concepts were needed in post-Linnaeus to deal with the chaos created due to subsequent naming.
* **Priority**: first published name is the correct one to use in both codes (with some differences).
* **Availability:** a properly published name is “available” in zoological name (known as “validly published” in ICBN)
* **Validity**: the correct name to use (known as “correct name” in ICBN)
* **Recombining author**: in ICBN, the concept of priority includes a particular binomial combination. For instance, when Cucamis *chrysocomus* Shumacher, (1827) moved to a different genus, it becomes *Rhaphiodiocystis chrysocoma*(Shumacher) C. Jeffrey (1962). But in ICZN, species authorship is unchanged. eg. *Bothynoproctus portai* Straneo, 1941 and after moving to a different genus, it became Neotalis *portai* (Straneo, 1941).
* **Tautonyms**: In ICBN, tautonyms are prohibited. In ICZN, tautonyms are allowed. eg.  *Bison bison* is an available name.
* **Recent vs date for priority**: In ICBN, names based on a recent type specimen have priority over names based on a fossil type, while in the ICZN the first valid publication in all cases is used.

# The Applications of Taxonomic Results

* Taxonomy depends on other field of biological sciences & other disciples of natural sciences for its data. Thus, it is probably unique in being a science without any data of its own.
* In turn, it is expected to serves workers who are dealing with living things by providing the correct identification of their organisms’ of study, along with the relationships of the study organisms with other living things.
* It supports various scientific disciplines including conservation science, evolutionary biology, bio-discovery, ecology, biogeography, medicine, etc.
* In selection of high yield/disease resistant crops, biological control of pests, in conservation of endangered, rare and vulnerable plants or animals, in drug discovery,in invasive species and pest management, etc, taxonomy plays a major role.
* **N.B:** Taxonomy is basic to other life sciences and at the same time, it is dependent on them. It has to depend for its improvement, and indeed for its existence, extremely on information from other fields such as Morphology, Anatomy, Embryology, Cytology, Biochemistry, Physiology, Genetics/ Molecular Biology, Ecology, Biogeography, etc. Generally, taxonomy has no data of its own.