

Taxonomy and Classification

"Wisdom begins with calling things by their right names"
-Chinese Proverb

Taxonomy = the science of naming and describing species

about 2 million different species of life have been described

museums contain ~ 2 Billion specimens worldwide

most scientists estimate that there are at least 50 Million actual species sharing our planet today

each year ~ 15,000 new species are described

most will probably remain unknown forever:

- the most diverse areas of world are the most remote
- most of the large stuff has been found and described
- not enough researchers or money to devote to this work

Common vs Scientific Name

many larger organisms have "common names"

- but sometimes >1 common name for same organism
- sometimes same common name used for 2 or more distinctly different organisms

eg. daisy eg. moss
eg. mouse eg. fern
eg. bug

without a specific (unique) name it's impossible to communicate about specific organisms

it would be impossible to know if scientist are working on the same species

it would be difficult constructing natural histories and anatomies of a single species

we couldn't understand how an ecosystem works without knowing each of the "players"

we couldn't study and compare similar forms in terms of adaptation and evolutionary change

What Characteristics are used

how do we begin to categorize, classify and name all these organisms

some organisms, even in different kingdoms, outwardly look very similar

earliest attempts used general appearance ie anatomy and physiological similarities

plants vs animals

- only largest animals were categorized everything else was "vermes"

→ but algae, protozoa

today, much more focus on molecular similarities proteins, DNA, genes

History of Classification

Early naturalists often took others word for the existence of a particular species without verifying them with actual samples. These early catalogues often contained colorful descriptions of fanciful plants and animals

Aristotle

was the first to try to name and classify things based on structural similarities

described ~520 species of animals; esp around Greece

believed a name should reflect hidden reality or essence

used phrases or single words, not consistent

Theophrastus classified plants into herbs, shrubs and trees

after invention of the printing press in 1400's "**Herbals**" were printed they emphasized plants with medicinal uses

Carolus Linnaeus,

a Swedish botanist,

developed and published the first comprehensive and consistent classification system for both plants and animals:

plants: Species Plantarum 1753
(described and classified all plants known in his time = 7300 species)

animals: Systema Naturae 1758

Linnaeus

categorized and classified ~8000 different plants and ~10,000 animals

(including 828 mussels & molluscs; 2100 insects; 4777 fish, birds & mammals)

he split the world into three great "Kingdoms"
animals
plants
minerals

'God designed life; Linnaeus did the filing'

offered the first comprehensive, consistent and much simpler method of naming and organizing species into a collection:

1. emphasized morphological characteristics as the basis for arranging specimens in a collection
2. each species is given a unique scientific name
→ while some species can have 100's of common names each has only one binomial name
3. each unique name is a binomial

binomial name: Genus + species epithet

before – species consisted of up to 12 words

eg. tomato

was: **Solanum caule inerme herbaceo foliis pinnatis incisiss racemis simplicibus**
(= Solanum with a smooth herbaceous stem, incised pinate leaves and simple inflorescence)

Linnaeus: **Solanum lycopersicum**

"God Created, Linnaeus arranged"

most names are descriptive, latinized or greek forms, often to honor someone

but there are also some irreverent names:

eg. *Verae peculya* → arthropod (?insect)
eg. *Heerz lukenatcha* → arthropod (?insect)
eg. *Pison eyvae* → arthropod (?insect)
eg. *Agra phobia* → beetle
eg. *Phthiria relativitae* → fly

sometimes "overdo" the descriptive value of a name:

eg. *Gammaracanthusktyodermogammarusloricatobai calensis*
→ was later disapproved

'type' species is collected and described for each new species discovered

when a new species is discovered a representative sample is collected and used as the "type"

this becomes a permanent part of a museum collection

4. species were arranged in an ascending series of inclusive categories or 'taxa'

is a hierarchy:

kingdom
phylum
class
order
family
genus
species

– a typical genus contains about 10-12 species

two species in same genus are more closely related than two in the same family; etc

Canis familiaris domestic dog
C. lupus gray wolf
C. latrans coyote

Felix domesticus house cat
F. leo lion
F. tigris tiger

Ursus americanus American black bear
U. ferox grizzly bear
U. maritimus polar bear

in this classification scheme only "species" is

a real category

the **species** is the basic unit of classification

→ the only real unit

→ higher taxa are purely mythical creations to help us understand relationships between organisms

and sometime change as our knowledge of the group increases

eg. "lumpers and splitters"

when Linnaeus 1st proposed his system evolution had not yet been formally proposed

after Darwin taxonomy took on a new role

→ was also used to reflect **evolutionary relationships**

the original hierarchy was used just to categorize degrees of similarity between organisms

after Darwin it was reinterpreted to show phylogenetic relationships

→ to construct **evolutionary trees**

1. look for anatomical and physiological similarities
2. compare with similar fossils that might exist
3. study its embryological development
4. ecological characteristics

eg. classes older common ancestor
eg. genera younger common ancestor