

Unit 3: Taxonomy, the Science of Classification

**Biodiversity: there is an incredible variety of life forms on earth
scientists have described & classified >3 million different
life forms**

**scientists estimate there are several million more to be
discovered**

So where are these life forms?

Taxonomy is the science of classification

**taxo: to arrange or put in order nomy: law of
the law of arrangement or science of classification**

We classify or group things all the time

Examples of classification systems used everyday:

Why do we classify things?

Carolus Linnaeus: Father of Taxonomy

developed system of classification in 1700's based on structural similarities

came up w/hierarchical system consisting of 7 diff taxa

this system is still in use by most scientists today, however, we are in a period of change, some scientists feel the Linnaean system is outdated

Linnaeus' system, taxa go from broadest to most specific

Kingdom

Phylum

Class

Order

Family

Genus

Species

Linnaeus also addressed a naming problem

what kind of names does the general pop use?

common names: mountain lion, white oak, crayfish

there are problems w/common names

**1-confusing: w/in the same country, we have different names
for same organism**

mtn lion =

crayfish =

**2-misleading: name given may make you think it is
different organism**

ex:

**how can scientists from different areas of same country &
different areas of world communicate?**

Linnaeus gave us binomial nomenclature

bi=2 nom=name clature=system

system of using 2 names to name an organism

scientific name uses the last 2 taxa to name organisms

Genus species

genus is always capitalized, species is lower case

both words *italicized* or underlined

why? b/c we use Latin words

Why choose Latin?

1-dead language

the meanings will never change

2-all educated people of day knew Latin

3-very descriptive language

4-roots of most modern languages

***Canis*: dog genus**

***Canis familiaris*: "of the household" dog**

***C. latrans*: "to bark" coyote**

***C. lupus*: "wolf" wolf**

trivia: Linnaeus from Sweden, born Carl von Linne

he latinized his own name

So what is a species?

first, species always includes genus name

species name alone gives no real info

genus is like last name, species is like first name

**members of same species are structurally similar and can
interbreed and produce fertile offspring**

today's definition adds: have same # chromosomes

there are also divisions beneath species level

subspecies

in plants, called varieties

in animals, called breeds

**members of subspecies can mate & produce fertile offspring
w/others of same species, but there are subtle differences**

btw groups: think dog breeds

all dog breeds can mate theoretically

in actuality, Great Dane & Chihuahua?

there are 3 main types of variations in members of same species

1-polymorphism

when 2 or more distinct forms exist in population

males/females

moths p. 424: peppered moth, light/dark

flowers: impatiens

2-geographic variations

**when species occupies large geographic range w/distinct
local environments, populations have evolved unique
physical characteristics**

human races: skin color, body build

American Eskimo or Inuit: short limbs, stocky

races near equator

3-individual variations

due to genes inherited from parents

Problems with species concept

Taxonomy is human-made construct, so species concept

is human-made category, but it is based on what we see in nature

How does one species recognize its own members?

many animals in backyard - rabbits, squirrels, mice

many animals in Yellowstone - deer, elk, bison, wolves

yet they remain separate, this is due to pre-mating mechanisms that keep them from mating

- chemical cues - pheromones**

- behavior cues - mating rituals, songs, displays**

- anatomical differences - prevention of mating**

- range differences - the ranges do not naturally overlap**

ex. - polar bear, *Ursus maritimus*, & grizzly bear, *U. arctos horribilis*

Post-mating mechanisms: Some very closely related species can mate, meaning the sexual parts fit together, but

- the sperm may not be able to fertilize the egg
due to differences in chemistry**
- the sperm fertilizes the egg, but there are problems with development, embryo is miscarried**
- the sperm fertilizes the egg, development proceeds normally, a living offspring is produced, but it is sterile,**

horse & donkey -----> mule

zebra & donkey -----> zonkey

Speciation: the formation of a new species

**so if there are all these mechanisms to keep species separate,
how do we get new species?**

**there are > 3 million different species, life began in the seas
with single-celled organisms, so lots of speciation has
occurred**

but speciation does not happen before our eyes, it takes time

2 possible examples occurring now:

1- let's go back to polar bear & grizzly bear

**these 2 species look totally different and their
ranges do not naturally overlap, so we have
designated them as different species, *but*
guess what? they can mate and produce
fertile offspring in captivity**

**and what is happening environmentally right now?
climate change - what is the effect on organisms?**

2- let's go back to the horse & donkey

**in 1984, a mule gave birth to a colt
so there was a mule born that was not sterile**

could we be seeing speciation in the works?