

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outdated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 under natural conditions
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: things that keep organisms from mating

- chemical cues - pheromones
- behavior cues - mating rituals, songs, displays
- anatomical differences - prevention of mating because sexual parts don't fit
- 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?

