

# Biogeography. Lecture 13

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# Outline

## Basics of ecology

Ecosystems and biosphere

## Taxonomy

Basic principles



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## Basics of ecology

Ecosystems and biosphere

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Basic principles



# Basics of ecology

## Ecosystems and biosphere



# Biosphere, geomerid or Gaia

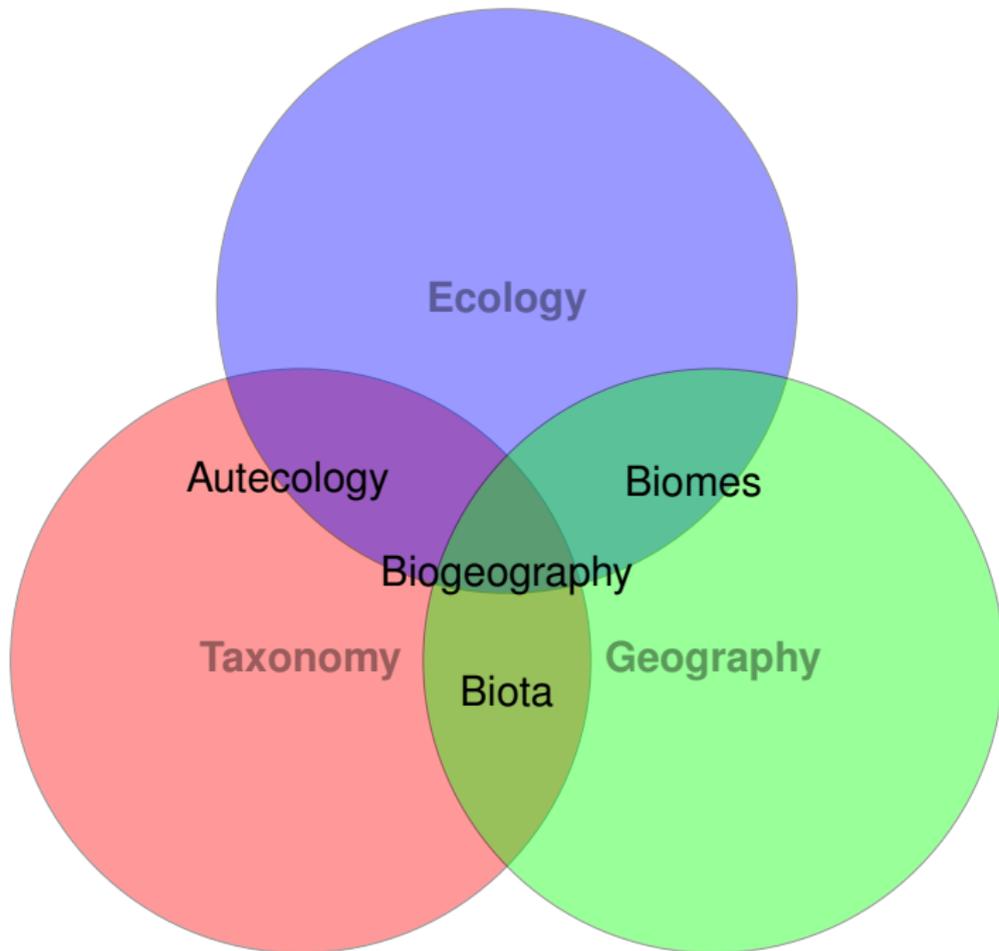
- ▶ All living things together with ecological factors
- ▶ Biomass: living matter
- ▶ Water, oxygen, carbon dioxide, nitrogen and phosphorous cycles
- ▶ Biosphere consists of biomes, geographically “packed” ecosystems



# Taxonomy

## Basic principles





# Two corner stones

- ▶ The diversity around us has a structure
- ▶ This structure is hierarchical



## How to describe hierarchy

- ▶ With ranks

Simple, efficient, practical. However, for every name you will need to remember a rank\*. Also, number of ranks is restricted so some potentially useful information will be ignored. Last but not least, no clear definition of any rank exists. The working definition is “*we will call this family because in the neighbor order we apply the family rank to similarly segregated groups*”.

\*There are multiple workarounds, e.g. endings and numerical ranks.

- ▶ With trees

More objective, no need to remember rank, no restrictions for numbers of levels. However, you should remember the graphic object instead of text, interpretation is not easy, conflicts are not simple to resolve. As a result, it is much easier to become lost with trees than with ranks.

Many current approaches try to cross ranks and trees.



# Names and ranks

- ▶ Ranks (including species) are very useful practically but do not have explicit criteria
- ▶ 7 basic ranks: species, genus, family, order, class, phylum, kingdom
- ▶ Names of species are binomial. This is again extremely useful but will result in instability—binomial names are not perfect IDs



# Priority, starting dates and conservation

- ▶ The earlier name is always preferred. Good rule, but adds to the instability of names.
- ▶ Starting dates allow to disregard all names published before 1753 (for plants) or 1758 (for animals)
- ▶ Conservation allows to disregard older names if the newer name is conserved



## Example of typification: oleaster family



Elaeagnaceae Juss. (oleaster family): 3 genera



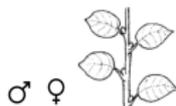
*Elaeagnus* L. (oleasters): 50–70 species



*Elaeagnus angustifolia* L. (Russian olive)—**type species** of genus



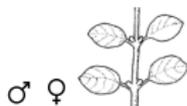
*Elaeagnus commutata* Bernh. (silverberry)



*Hippophaë* L. (sea-buckthorns): 7 species



*Hippophaë rhamnoides* L. (Siberian sea-buckthorn)—**type species**



*Shepherdia* Nutt. (buffaloberries): 3 species



*Shepherdia argentea* (Pursh) Nutt. (buffaloberry)—**type species**



# Typification

The process of tethering name to sub-taxon or type specimen:

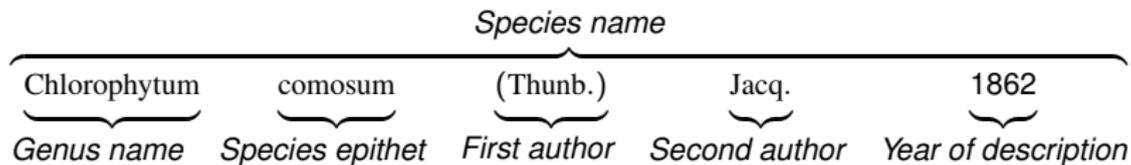
- ▶ Initially, oleaster family contained two genera, *Elaeagnus* and *Hippophaë* (sea-buckthorn). Second genus included *Hippophaë rhamnoides* (Siberian sea-buckthorn, **type species**) and *Hippophaë canadensis*.
- ▶ Thomas Nuttall decided to split sea-buckthorns and separate *Hippophaë canadensis* to the new genus. How to name these two genera?
- ▶ Since the first genus still contains *Hippophaë angustifolia*, the **type species**, it should keep the name *Hippophaë*
- ▶ The second genus can be named arbitrarily. Nuttall gave it name “*Shepherdia*”. As a result, the species which had name *Hippophaë canadensis*, became *Shepherdia canadensis*.

The same logic is applicable to the situation when you split species into two. However, in this case species name will be tethered to the physical **type specimen**—designated collection (in this case, herbarium) sample.



# Names and endings examples

English	Latin	Example 1	Example 2
Kingdom	Regnum	Vegetabilia	Animalia
Phylum	Phylum	Spermatoph <u>yta</u>	Chordata
Class	Classis	Angiospermae (Magnoliopsida)	Mammalia
Order	Ordo	Liliales	Primates
Family	Familia	Asparagaceae	Hominidae
Genus	Genus	<i>Chlorophytum</i>	<i>Homo</i>
Species	Species	<i>Chlorophytum comosum</i> (Thunb.) Jacq. 1862	<i>Homo sapiens</i> L.



# Summary

- ▶ There are seven main taxonomic ranks
- ▶ There are four kingdoms of living organisms



# For Further Reading



A. Shipunov.

*Biogeography* [Electronic resource].

2014—onwards.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_330](http://ashipunov.info/shipunov/school/biol_330)



Ecology.

<http://en.wikipedia.org/wiki/Ecology>

