Biogeography. Lecture 9

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Outline

Very Basics of Ecology

- Human-related ecological factors
- Ecological niche
- Ecosystems and biosphere

Darwin Day and extra credit

Very Basics of Ecology

Human-related ecological factors

Anthropogenic factors

- Direct
  - Collecting
  - Hunting
  - Plowing
  - Tree cutting
- Indirect
  - Grazing
  - Polluting
  - Melioration
  - Recreation

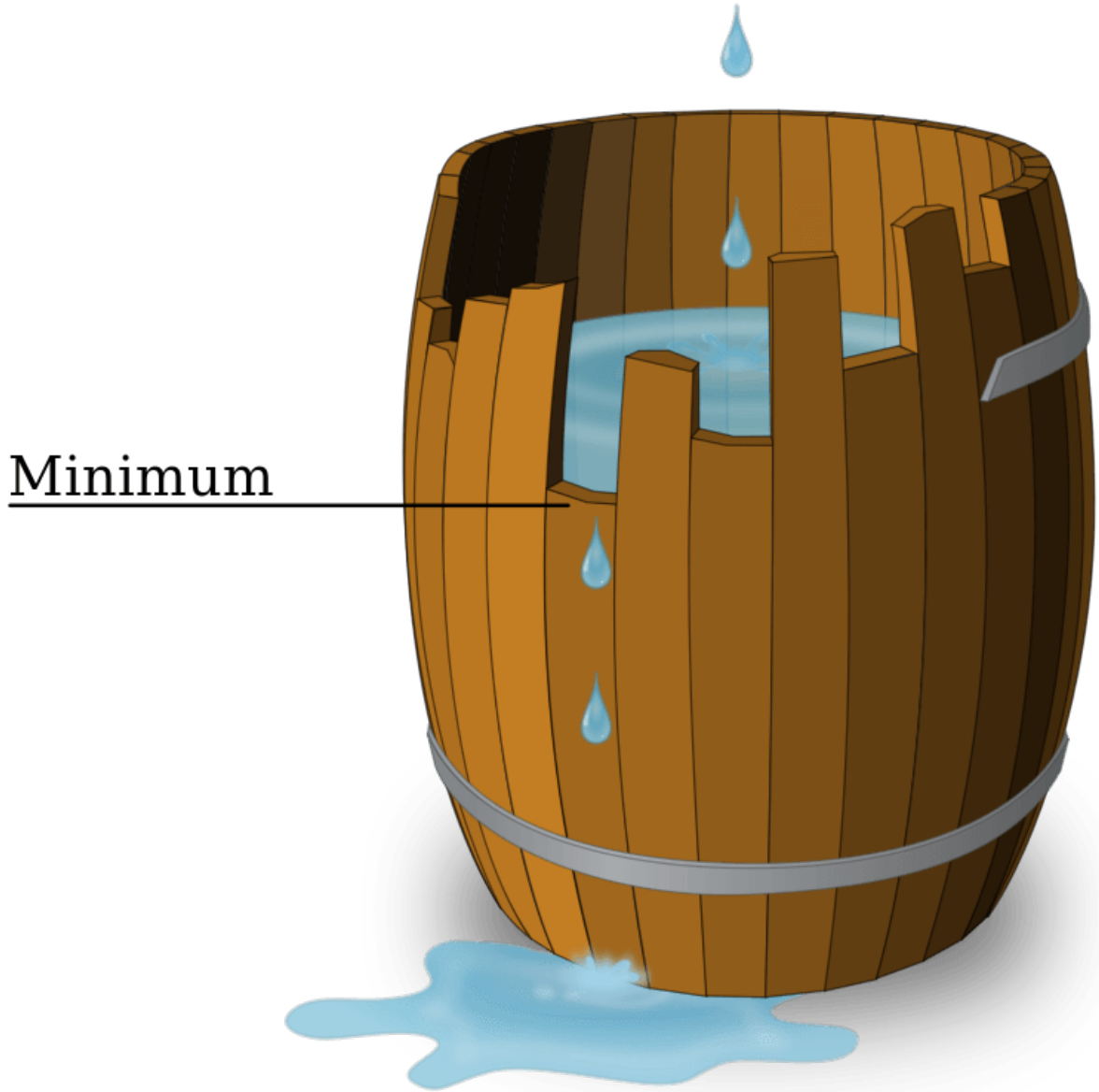
Very Basics of Ecology

Ecological niche

The cloud in hyper-space of ecological factors

- Response function: euryoecious and stenoecious species
- Fundamental and realized niche
- Liebig's law of the minimum

Liebig's barrel



Very Basics of Ecology

Ecosystems and biosphere

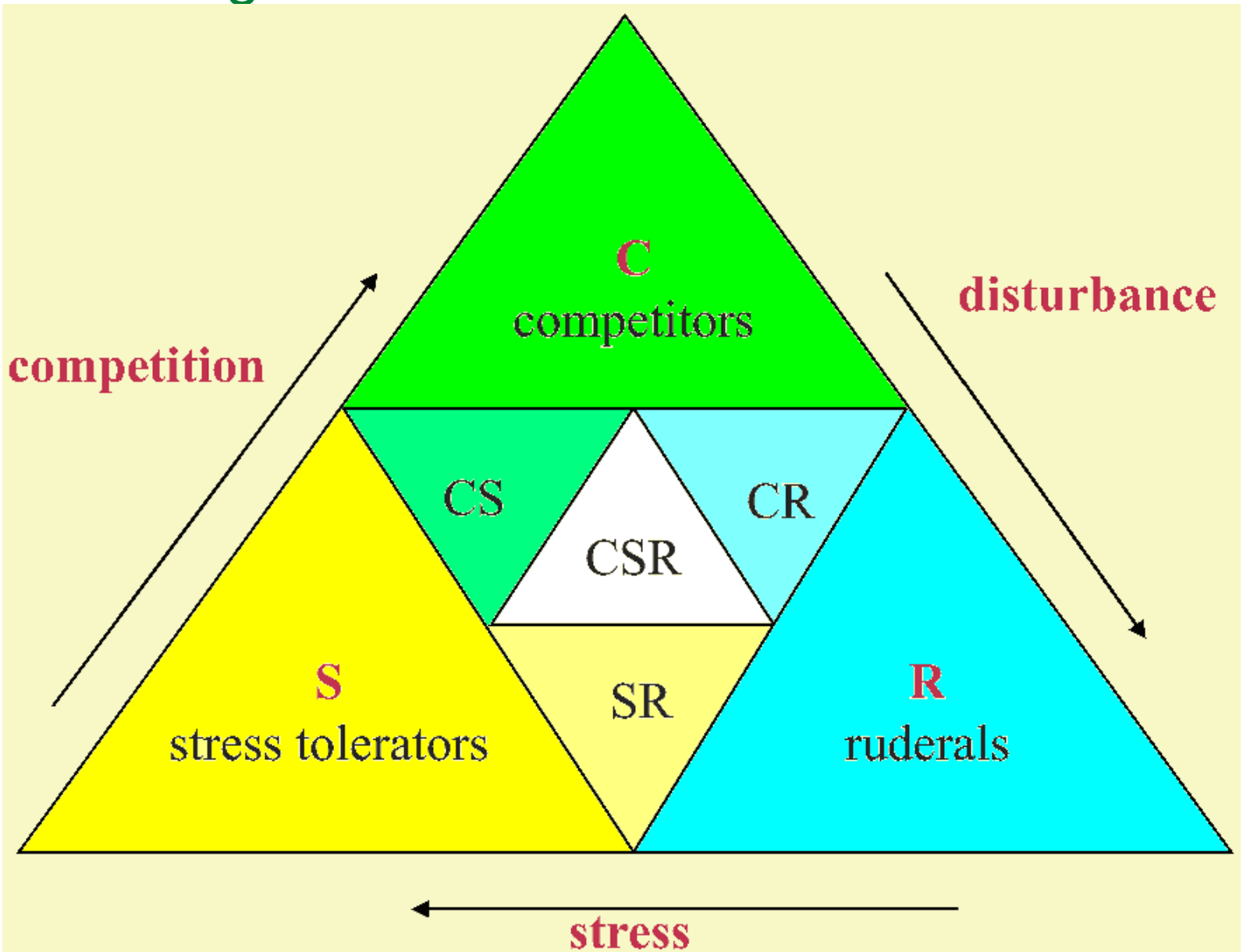
Features of ecosystem

- Biomass, diversity, structure (feeding network, stratification)
- Self-reproduction and self-regulation
- Biosphere is the largest ecosystem possible
- Ecosystem could be split in different ways, for example into life forms and then into populations

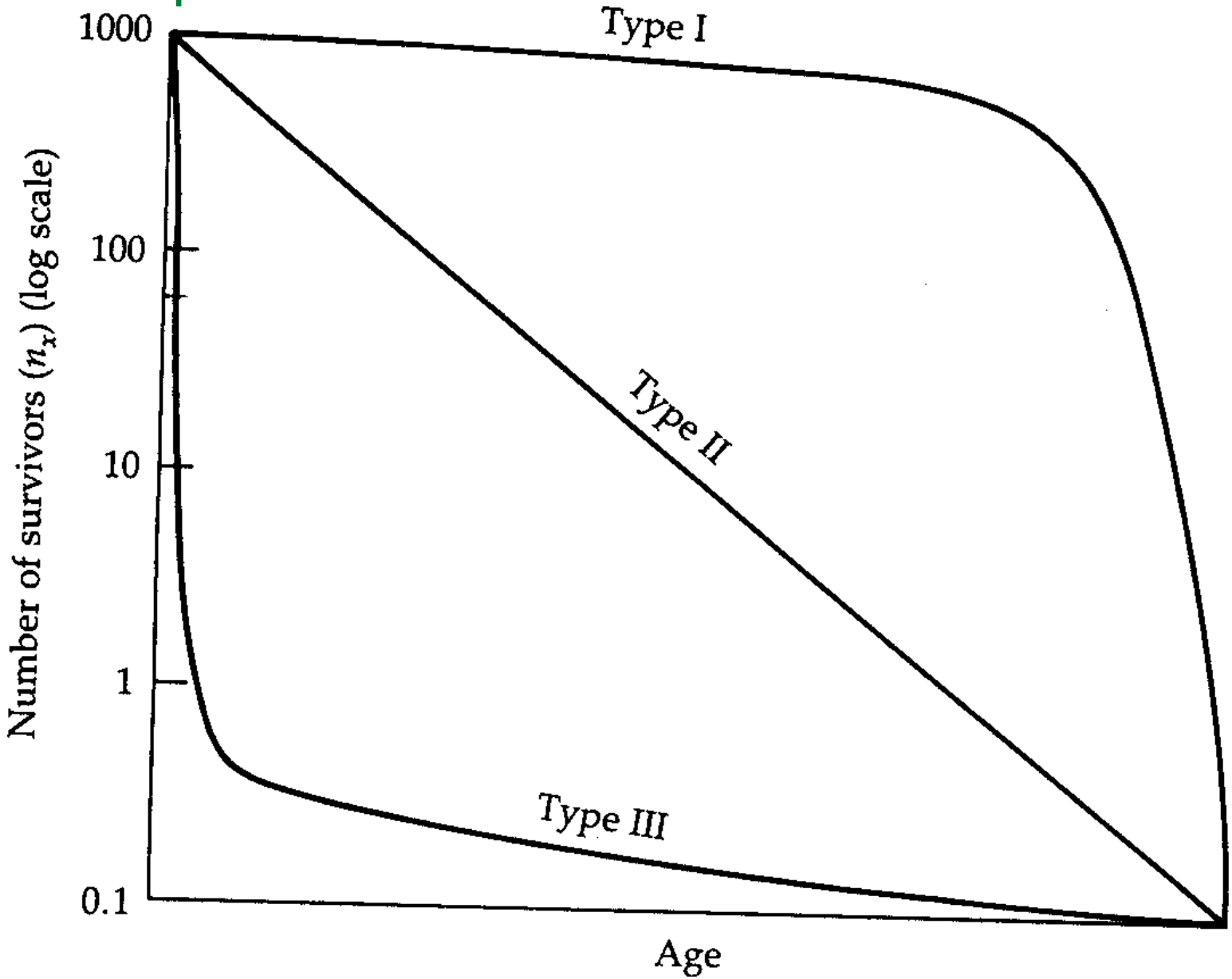
Populations

- Plant strategies: C (competitive), S (stress tolerant) and R (ruderal, or rapid propagation).
- Survivorship curves, population growth curves, r- and K-strategy

Grime's triangle



Survivorship curves



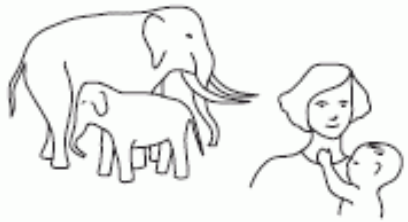
Strategies

r strategy

- Precarious equilibrium with the environment
- High rates of increase
- Violent and in some cases regular cycles of growth and decline

K strategy

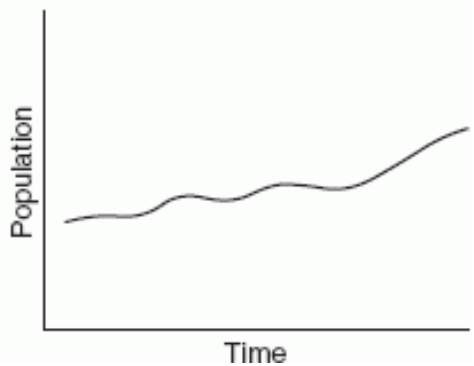
- Stable equilibrium with the environment
- Rates of increase compatible with environment
- Slow and irregular cycles



Bioreproductive characteristics

- Small bodies
- Short lives
- Short gestation
- Large litters
- Short intervals between births
- Short length of generation
- High potential rates of growth

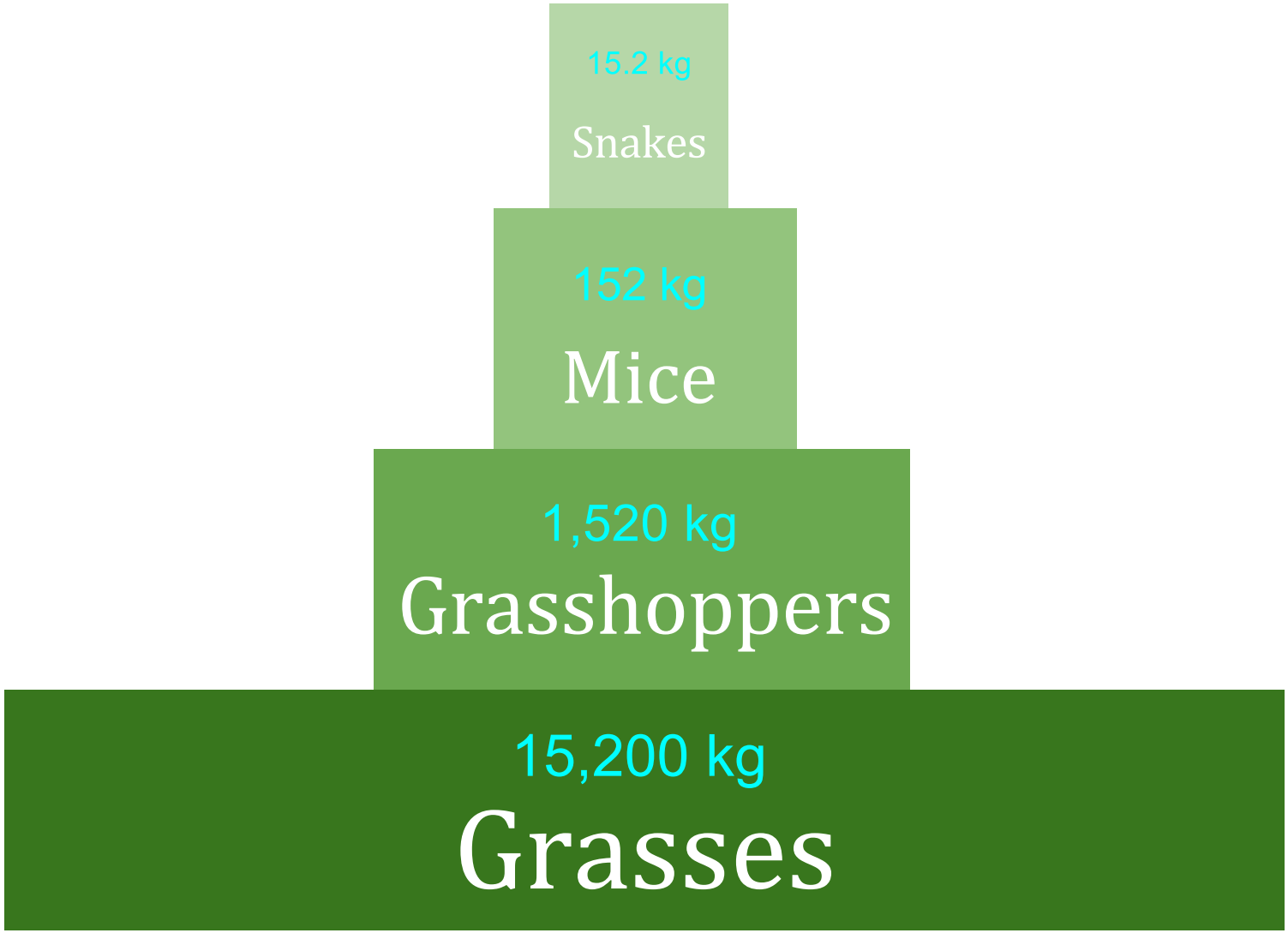
- Large bodies
- Long lives
- Long gestation
- Single births
- Long intervals between births
- Long generations
- Low potential rates of growth



Food webs

- Plant-based: producer – herbivore (consumer I) – carnivore (consumer II) etc.
- Detritus-based: decomposer – detritivore – carnivore (consumer II) etc.

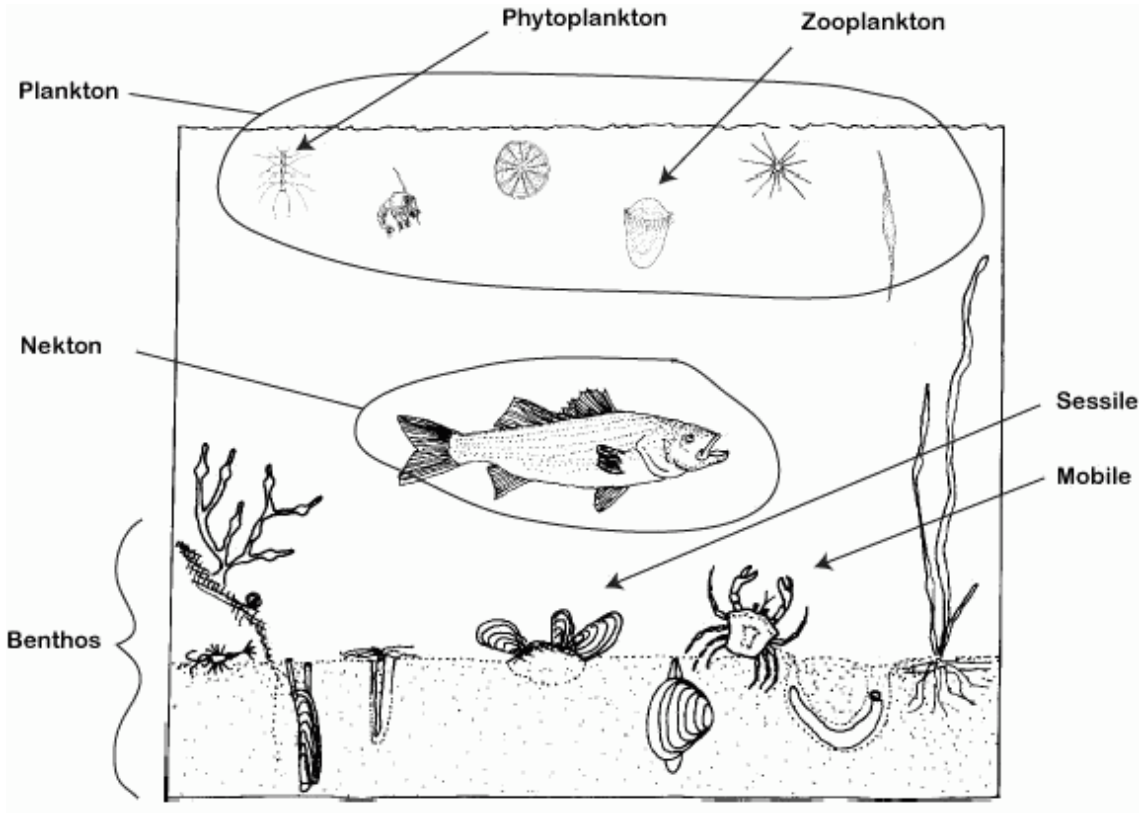
Energy and biomass pyramid (terrestrial)



Examples of ecosystems' structures

- Pond: phytoplankton, zooplankton, nekton, bentos
- Ocean: pelagic and littoral zones and some additional layers like neiston (first mm of surface)
- Forest: layers

Plankton, nekton and bentos



Succession

- Temporal chain of ecosystems
- Primary or secondary
- May start on bare minerals, river deposits, water
- May end with “climax” (F. Clements)

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

Summary

- Ecology studies relation between organisms and environment
- Ecosystems are self-reproduced and self-regulated units
- Biosphere (living Earth) is a biggest ecosystem
- Phosphorous cycle is the most critical to biosphere

For Further Reading

A. Shipunov.
Biogeography [Electronic resource].
2014—onwards.
Mode of access:
http://ashipunov.info/shipunov/school/biol_330

A. Shipunov.
Introduction to Biogegraphy and Tropical Biology [Electronic resource].
2017—onwards.
Mode of access: http://ashipunov.info/shipunov/school/biol_330/intr_biogeogr_trop_biol/intr_biogeogr_trop_biol.pdf