Glossary Ecology

Abundance: The number of organisms in a population, combining "intensity" (density within inhabited areas) and "prevalence" (number and size of inhabited areas).

Adaptation: 1) Characteristics of organisms evolved as a consequence of natural selection; 2) Changes in the form or behavior of an organism during life as a response to environmental stimuli; 3) Changes in the excitability of a sense organ as a result of continuos stimulation.

Allochoton: see biomass.

Autochoton: see biomass.

Biodiversity: (Gk. bios, life) Refers to aspects of variety in the living world; used to describe the number of species, the amount of genetic variation or the number of community types present in the area.

Biogeochemical Cycle: The movement of chemical elements between organisms and non-living compartments of the atmosphere, lithosphere and hydrosphere.

Biogeography: The study of the geographical distribution of organisms; it largely depends on abiotic factors, resources, community interaction, mobility of organisms (whether large or small), topography, geo-historical factors (continental drift, island formation, etc.) e.g. small island hosts fewer species, fewer resources, fewer habitats than a larger one; the species on an island are balanced by the death- and immigration rate of organisms but is less stable compared to a larger island or even continent - applies for natural reserves as well (see ecology pattern and disturbance - space).

Biomagnification: The increasing concentration of a compound in the tissues of organisms as the compound passes along a food chain, resulting from the accumulation of the compound at each trophic level prior to its consumption by organisms at the next trophic level, as seen with DDT.

Biomass (organic matter): Total dry weight of all organisms in a particular population, sample or area; [J/m^2];

Allochoton: Organic matter entering a stream, lake or ocean but derived from an adjacent terrestrial system; e.g. falling leaves from a tree located at the banks of the river.

Autochoton: Organic matter produced within a community e.g., fresh-water plants within a river.

Necromass: The weight of dead organisms, usually expressed per unit of land or volume of water. The term is sometimes used to include the dead parts of living organisms, e.g. the bark and heartwood of trees, the hair and claws of animals.

Production of B.: (see also trophic level);

- **Gross Primary P**: (**GPP**) The total fixation of energy by photosynthesis in a region.
- **Net Primary** P.: (**NPP**) The total energy accumulated by plants during photosynthesis (gross primary production minus respiration).
- **Primary** P.: The rate at which biomass is produced per unit area by plants.
- **Secondary** P.: The rate at which biomass is produced per unit area by heterotrophic organisms.

Biome: Large, ecological unit composed of similar types of climax communities on a global scale, arising as a result of complex interactions of climate, other physical factors, and biotic factors (e.g., rainforest, tundra, grassland....)

Biosphere: The zone of air, land and water at the surface of the earth that is occupied by organisms.

Biotic: Living; usually applied to the biological aspects of an organism's environment, i.e. the influence of other organisms (opposite of abiotic).

Abiotic: Non-living; usually applied to the physical and chemical aspects of an organism's environment; e.g. salinity, pH, humidity, light (is a biotic necessity in autotrophic organisms) etc. the environment can be considered a heteromosaic of abiotic conditions, changing with time and space.

Biotope:

Canopy: (Gk. canopion, net) The dense roof-forming vegetation, typically represented by the crowns of the trees; kelps, brown algae, can also form dense forest-like canopies.

Carrying Capacity (K): The maximum population size that can be supported indefinitely by a given environment, at which intraspecific competition has reduced the per capita net rate of increase to zero (idealized) - or the crosspoint of natality and mortality patterns in a population (see population and growth):

$$\frac{dN}{dt} = r \cdot N \cdot \frac{(K-N)}{K}$$

r = (natality + immigration) - (mortality + emigration)

N, population density	[-]
K, carryaing capacity	[-]
r, intrinsic rate of growth	[1/s]
t, time	[s]

Climate: The accumulation of seasonal weather patterns in an area over a long period of time.

Macroclimate: Global climatic patterns.

Microclimate: The climate within a very small area or in a particular, often tightly defined habitat; e.g., temperature gradient a few mm above a leaf, or along a tree trunk, etc.).

Climax: The presumed endpoint of a successional sequence.

Climax Community: Is largely determined by the climate and soil of the region; such a community has reached a steady state in a successional series (see there).

Climax Mosaic: A once established climax community can't be considered stationary but rather follows a pattern of micro-successional events caused by death and birth cycles of every organism living within. Succession occurs anywhere at any time and just depends upon the scale based on (climatic region, altitude, etc.).

Coexistance: The living together of two species (or organisms) in the same habitat, such as that neither tends to be eliminated by the other.

Community: The species that occur together in space and time; (see diversity and isotherms).

C. **Stability**: The tendency of a community to return to its original state after a disturbance (competition, temporarily changing environment, etc.)

- **Resiliance**: The speed at which a community returns to its former state after it has been disturbed.
- **Resistance**: The ability of a community to avoid displacement from its present state by a disturbance.

C. **Dynamically Fragile**: One that is stable for only a very limited range of environmental characteristics, e.g. a stable and predictable environment (predator-prey and human caused disturbances).

C. **Dynamically Robust**: One that is stable within a wide range of conditions, e.g. in a very variable and unpredictable environments.

C. **Interaction**: Specifies how many species can flourish in a given system, e.g., tide pool, canopy, grassland, etc. A generalist (predator) can have a positive effect by increasing species diversity; if the prey (established by growth and reproduction) is more dominant than the predator community.

C. Environmental **Interaction**: A stable "environment" that has the potential to evolve to a complex and very stable system; a constantly changing environment will not allow an ever increasing complexity - complexity does not necessarily stand for stability, instead it should be seen as a dynamic succession within the food-web.

C. **Structure**: The list of species and their relative abundance in a community; the higher the probe, the better the interpretability of its structure.

Competition: Interaction between members of the same population or of two or more populations to obtain a resource that both require and which is available in limited supply, hence, limiting overall fitness (survival, growth, reproduction of an organism).

Asymmetrical C.: Competition between two organisms (or species) in which one is much more severely affected than the other (principle of displacement of the weaker by the stronger organism).

Exclusion C.: The elimination from an area or habitat of one species by another through interspecific competition.

Exploitation C.: Competition in which any adverse effects on an organism are brought about by reductions in resource levels caused by other competing organisms (on a first come first serve basis).

Interference C.: Competition between two organisms in which one physically excludes the other from a portion of a habitat and hence from the resources that could be exploited there.

Interspecific C.: Competition between individuals for the same limited resources by different species - (exclusion principle of Gausse) competing species relying on the same ecological resources cannot exist together.

Intraspecific C.: Competition between individuals for the same limited resources by the same species.

Symmetrical C.: (see asymmetrical competition).

Competitive Exclusion Principle: Two species with similar environmental requirements cannot coexist indefinitely in the same habitat. (see Gausse's principle.)

Consumer: An organism within an ecosystem, plant or animal, that derives its food from another organism (see predator).

Cycle: Biogeochemical cycles on a global and local scale.

Carbon C.: The global flow of carbon atoms from plants through animals to the atmosphere, soil, water and back to plants. CO_2 level increased significantly over the last 200 years, mainly through burning of fossil fuels, exploitation of tropical forests aggravate this trend (see greenhouse effect).

Nitrogen C.: The cycling of nitrogen between organisms and the earth. Deforestation and land clearance leads to a substantial increase in N and NO_2- loss in the atmosphere. N-rich fertilizers find its way as run-offs into oceans and lakes - eutrophication. NH_3, as atmospheric pollutant from livestock farms change flatlands in other geographical areas by enriching the net N equation favoring organisms not found there so far. NOx- emissions from combustion processes aggravate the already stressed atmospheric N-balance.

Phosphorus C.: The cycling of phosphorus between organisms and soil, rocks, or water. Open, sedimentary cycle; mineral P tends to be carried from land to the oceans (e.g. by fishing) or is mined from mineral storage sites and will be added to the global cycle later on. Much of it is agricultural run-off; deforestation and erosion contribute as well, together lead to eutrophication.

Sulfur C.: Plants usually absorb ionic sulfur (SO_4^{2-}) and animals recycle the element, releasing it back into the soil in urine and feces. Bacterial decomposition of wastes releases hydrogen sulfide (H_2S). H_2S may in turn enter the atmosphere, forming sulfur dioxide (SO_2), or it may enter the soil or water, where various groups of bacterial convert it to sulfates. In addition to volcanic activities, anaerobic respiration and human aggregation along with combustion processes, locally increase SO_2 levels rendering rain more acid, and effecting pH-levels in hydrospheric ecosystems.

Water C.: Evaporation from the oceans precipitates on land. Burning of fossil fuel increases green-house gas emission, which in turn rises humidity levels within the atmosphere; cooling towers in power plants contribute this as well.

Decomposer: Organisms (bacteria, fungi, heterotrophic protists) in ecosystems that break down complex organic material into smaller inorganic molecules that then are recirculated.

Denitrification: The conversion of nitrate to gaseous nitrogen; carried out by a few genera of free-living soil bacteria.

Density: In relation to population, the number of individuals in a certain amount of space.

Absolute D.: Number of organisms over unit of volume [$1/m^3$].

Relative D.: Comparison of relative density, e.g. here more, there less.

Regulation of Population size: Natural curbs on population growth fall into two categories:

- **Extrinsic** R.o.P.S.: Originate <u>outside</u> the population and include biotic factors, such as food supplies, natural enemies, and disease-causing organisms, as well as physical factors such as weather, shelter, pollution, habitat lose, rainfall, etc.
- **Intrisic** R.o.P.S.: Originate <u>within</u> the community, physiology, or behavior, e.g. crowded conditions and depletion of resources; consequently, lowers the rate of population growth and / or favors migration away from food-depleted regions.

D. **Dependent**: The tendency for the "+" death rate in a population to increase, or the "-" birth rate to decrease, as population density increases; e.g. due to diseases, competition among the population, etc.

D. **Independent**: Death and birth rate in a population neither tends to rise or to fall as the density increases. It is mainly depended on <u>adverse</u> environmental changes.

Undercompensating D. Dependence: Death rate increases (or birth / growth rate decreases) less than initial density increases, that increase in initial density still leads to (smaller) increases in final density.

Overcompensating D. Dependence: Density dependence which is so intense that increases in initial density lead to reductions in final density.

Dispersal: The spreading of individuals away from each other, e.g., the offspring from their parents and from regions of high density to regions of low density; (analog to diffusion, as seen with the import of the potato beetle to Europe).

D. **Capacity**:

D. **Polymorphism**: Two or more types of dispersal structures found within a species or among the progeny of an individual.

Distribution: The spatial range of a species, usually on a geographic but sometimes on a smaller scale, or the arrangement or spatial pattern of a species over its habitat.

- food resources will lead to this distribution.

D. over **Space**:

- Altitude: Species diversity less abundant in higher than lower altitudes.
- Latitude: Ecosystems are more complex in equatorial regions than in higher latitudes (poles)
- Scale: The greater the sample the better interpretability.
- Spatial:
- **Aggregated or Clump** D.: Individuals form one or more clumps, attracted to areas with the greatest availability of food or shelter and avoiding less hospitable terrain.
- **Random** D.: Individual spacing would be determined by chance.
- **Regular or Uniform** spacing D.: Individuals may also be drawn together by some social interaction, such as mating or parental care. In other cases, antagonistic interactions between individuals or scarce

D. over **Time**:

- Habitat: (see there).
- Succession (see there).

Disturbance: In community ecology, an event that removes organisms and opens up space which can be colonized by individuals of the same or different species.

Diversity: An index of community diversity that takes into account both species richness and the relative abundance of species.

D.-**Index**: A mathematical index of species diversity in a community = D; it reads as the sum of all individuals of one species (N_{max}) divided by the sum of all individuals within one community (N_{total})

- Simpson Index: $D= 1/\lambda = 1/\Sigma(p_i)^2$
- Shannon Wiener Index: $H = -\sum p_i \cdot \ln(p_i)$
- Sorensen/ Dominanz Inex: $Q_s = 2 \cdot j/(a+b)$

p_i, relative abundance of a species
a, Σ of individuals in a community a
b, Σ of individuals in a community b
j,

Ecology: The study of the interactions of organisms with their physical environment (abiotic) and with one another (biotic).

E. **Niche** : (see niche).

E. **Patterns**: Local patterns of a given area - based on the scale (the smaller the area, the less representative), pattern of altitude (flatland or alpine organisms, usually more complex in lower altitudes), distribution pattern (whether aggregated, clustered, or randomly distributed), habitat mosaic (grassland, forests, bushland, usually habitats, intermix at their outer limits - see distribution)).

Ecosystem: All of the organisms of a given area and the encompassing physical environment.

Human Activity and the E.: (see greenhouse effect);

- Harvest in Natural E.: Reducing population density through harvesting in natural environments; intraspecific competition is lowered, favoring survivorship; (see MSY).
- Agro-E.: antropogenic plant communities, continuity, monoculture, reduction in species diversity, additional nutrients (by fertilization), pest-control (by herbicides and pesticides), green desert.
- change of biogeochemical cycles (see cycles):

Energy: The power to perform chemical, mechanical, electrical or heat related tasks (see food chain).

E. **Flow in Ecosystems**: The higher the trophic level, the less energy is available to the predator.

E. **Pyramid**: Energy relationship among various feeding levels involved in a particular food chain; autotrophs (at the base) represent the greatest amount of available energy; herbivores are next; then primary carnivores; secondary carnivores; and so forth; similar pyramids of mass, size, and number also occur in natural communities (see biomass).

Endemic: Having their habitat in a specified district or area, or the presence of a disease at relatively low level, all the time.

Environment: The combination of all the external conditions and the potential effect of the inner environment (heteromosaic of abiotic conditions).

E. **Change**: Survival depends on the life span of the organisms involved, and has to adapt to a new situation via genetic change, evolution, etc.

- **cyclic** change: rhythmically repetitive, like cycles of a season, day / night, movement of tides etc.
- **directional** change: change is maintained over a long period in relation to the life span of organisms - erosion, siltation, cycles of glaciation, etc.
- **erratic** change: these have no rhythm and no consistent direction e.g., hurricanes, cyclones, flash storms, fires, vulcanos, earthquake, etc.

Epidemic: The outbreak of a disease which affects a large number and/or proportion of individuals in a population at the same time.

Eutrophication : Enrichment of a water body with plant nutrients (P and N), usually resulting in a community dominated by phytoplankton (see cycle - P,N).

Eutrophic : An aquatic environment with high nutrient levels, characterized by dense blooms of algae and other aquatic plants.

Evolution: (L. evolvere, to evolve) Changes in gene frequencies in a population over time.

Coevolution: (L. con with) The process by which members of two or more species contribute reciprocally to the forces of natural selection that they exert on each other; e.g. parasites and their hosts.

- Ce. o. **Gene**: The unit of inherited material - a hereditary factor.
- Ce. o. **Guild**: A group of species that exploit the same class of resources in a similar way.
- Ce. o. **Species**: The speciation of organisms with respect to the nature of their food resources e.g. mutualism, parasitism, commensalism (the longer the flower cone, the longer must be the proboscis of the nectar sucking insect.

Exclusion Principle: (see Gausse)

Extrinsic Factors: Literally, factors acting from outside. In ecology, physical and chemical features of the environment, and other organisms, are all extrinsic factors acting on an organism (see density factors).

Food: Organic compounds used in the synthesis of new biomolecules and as fuel in the production of cellular energy; i.e. carbohydrates (glucose), starch (amylose, amylopectic), proteins (from aminoacids), fatty acids, vitamins, trace elements.

F. **Chain**: A sequence of organisms through which energy captured from sunlight by photosynthesis is transferred from one consumer (or trophic level) to the next; each organism in the chain eats the preceding and is eaten by the following member of the sequence; there are seldom more than six links in a chain, with autotrophs at the bottom and the largest carnivores at the top.

F. **Web**: Representation of feeding relationships in a community that includes all the links revealed by dietary analysis; it depends upon the number of species involved and their connectiveness , i.e. number of connections (see community interactions)

N_S, number of species

$N_S \cdot N_C$ = constant

N_C, number of connections

Gausse Law: The idea that if two competing species coexist in a stable environment, then they do so as a result of differentiation of their realized niches; but if there is no such differentiation, or if it is precluded by the habitat, then one competing species will eliminate or exclude the other.

Generalist: (see resources).

Genet: The organism developed from a zygote. The term is used especially for modular organisms and members of a clone to define the genetic individual and to contrast with 'ramet' the potentially physiologically independent part that may arise from the interactive process by which modular organisms grow.

Grazer: (see predator).

Greenhouse Effect: Warming of the earth's atmosphere as a result of increases in CO_2 and other gases.

G. **Gases**: H_2O, CO_2, CH_4, NO_2.

Growth: An increase in size (see population and carrying capacity).

Intrinsic rate of growth: r = (natality + immigration) - (mortality + emigration)

Exponential G.: Growth in the size of a population (or other entity) in which the rate of growth increases as the size of the population increases (J-shaped curve).

Logistic G.: (S-shaped curve) Growth of a population under environmental constraints (carrying capacity-K) that sets a maximum population size (see selection).

Habitat: (L. habitare, to inhabit) The environment of an organism; the place where it is usually found.

H. **Cycle**: Seasonal-, day-night-, tide-cycles etc. Changes in habitat can be:

- Regular HC.: Repeated changes occurring over time (change of river bed, iceage, etc.)
- Irregular HC.: Changes like weather pattern, vulcanos, earthquakes etc.

H. **Diversity** : The range of habitats present in a region.

Holometabolism: (see survivorship curve - type IV)

Hypervolumina: (see niche).

N-Dimensional HV: The range of conditions, resource levels and densities of other species allowing the survival, growth and reproduction of an organism or species. Hence, if each condition, resource or other species is seen as a dimension, the niche is an n-dimensional hypervolume.

Individual: (see organism).

Interaction: (see community).

Intrinsic Factors: Factors acting from within, e.g. intraspecific competition, etc. (see density factors).

Island Biogeography Theory: Is in the application on nature conservation. This is because many conserved areas and nature reserves are surrounded by an 'ocean' of habitat made unsuitable, and therefore hostile, by humans

Isotherms: Virtual lines of identical temperature patterns across a given area in which similar species and communities can prosper - they are more numerous in the equatorial regions (more numerous predator-prey communities, a larger primary production etc.) than near the poles.

Life Table: A summary of the age-or stage-related survivorship of individuals in a population, based on natality and mortality rates.

Cohort LT: A life table constructed by monitoring a group of individuals all born during the same short period, from time of birth through to death of the last surviving individual.

Static LT: A life table constructed from the age structure of a population at a single moment in time.

Migration: The movement of individuals, and commonly whole populations from one region to another.

Emigration: The movement of individuals out of a population or from one area to another.

Immigration: Entry of organisms to a population from elsewhere.

Mortality: (see population).

MSY: (**M**aximum **S**ustainable **Y**ield): This is the highest harvesting rate that the population can match with its own recruitment, and as the name implies, it is the largest harvest that can be removed from the population on a regular and repeated (indefinite) basis. It is equal to the maximum rate of recruitment, and it is obtained from the population by depressing it to the density at which the recruitment rate curve peaks (always below K) - population which exhibit S-shaped growth, ideal MSY can be obtained where the rate of growth is fastest, i.e. graph has the highest growth rate over time, allowing more harvests within the same period of time. Detecting MSY is hard to find since the exact number of individuals of a population present, size, age, and different growth rate, survival and reproduction cycles alter slightly as it happened with the blue-whale population.

MSY-fixed quota: It doesn't reflect fluctuations in population size; can lead to the extinction, especially if fixed quota is higher than the recruitment rate; in such cases it is better to alter the mesh sizes in fishing nets for example....

Natality: (see population).

Necromass: (see biomass).

Niche: 1) The role played by (occupation or profession) and the address of a particular species in its ecosystem; 2) the range of conditions, resource levels and densities of other species allowing survival, growth and reproduction of organisms or species, hence *hyperdimensional* if condition, resources, etc. are seen in n-dimensions (see resources, generalist, specialist).

Complimentary N.: The tendency for coexisting species which occupy a similar position along one niche dimension, e.g. altitude, to differ along another, e.g. diet.

Fundamental N.: The potential range of all environmental conditions under which an organism can thrive (idealized).

Realized N.: The part of the fundamental niche that a species actually occupies in nature due to inter-/intra-specific competition.

Nitrification: The oxidation of ammonium ions or ammonia to nitrate; a process carries out by a specific free-living soil bacterium.

Organic: Pertaining to living organisms in general, to compounds formed by living organisms, and to the chemistry of compounds containing carbon.

Organism (individual**)**: Any individual living creature, either unicellular or multicellular:

Modular O.: One that grows by indeterminate iteration of the repeated parts or units of structure (modules), e.g. the leaves, shoots and branches of a plant, the polyps of a coral or bryozoan. Modular organisms are almost always branched, though the connections between branches may separate or decay and the separated parts may in many cases then become physiologically independent, e.g. Hydra spp, and duckweeds (Lemma spp.) - arrangements of single units form the entire organism, and strongly depends upon abiotic factors, resulting in a final unpredictable shape.

Unitary O.: Those that proceed by a determinate pathway of development of a tightly canalized adult form. e.g. all arthropods and vertebrates.

Poikilo- / **Homeothermic** O.: (see thermic).

Physiological Time: A measure combining time and temperature and applied to ectothermic (poikilothermic) organisms, reflecting the fact that growth and development in particular are dependent on environmental temperature and therefore require a period of time-temperature rather than simply time for their completion.

Plant: Those plants with a lower growth rate must either be able to photosynthesize at low light intensities, have a high growth rate relative to competitors elsewhere, or die. The evolution of plants with C4 and CAM photosynthesis can be seen in as follows: the physiological properties of such species enable to dominate climatic areas where their C3 ancestors would have either perished or been competitively excluded by more rapidly growing C4 or CAM species.

C3-P.: Those in which the assimilation of atmospheric CO_2 is directly incorporated via the 3-molecular enzyme ribulose-1,5-biphosphate carboxylase in the cells of the leaf-mesophyll (Calvin Benson Cycle).

C4-P.: Species of higher plants in which the assimilation of atmospheric CO_2 in photosynthesis is indirect - via the 4-molecular enzyme phosphoenol pyruvate carboxylase in the sheaths surrounding the veins of the leaves; (the set of reactions through which CO_2 is fixed to a compound known as phosphoneolpyruvate PEP to yield oxaloacetate, a four -carbon compound) - C4-plants typically convert more CO_2 with increasing light intensity than the C3 counterparts resulting in faster growth.

CAM-P.: (Crassulacean acid metabolism) A variant of the C4 pathway; phosphoneolpyruvate fixes CO_2 in C4 compounds at night; then, during the day time (with closed stomata), the fixed CO_2 is transferred (with the help of light) to ribulose biphosphate of the Calvin cycle within the same cell. Characteristic of most succulent plants, such as cacti.

Succulent P.: Plants with fleshy or juicy tissues with high water content characteristic of desert and saline environments.

Decidious P.: (L. decidere, to fall off) Shedding leaves at a certain season.

Vascular P.: (L. vasculum, a small vessel) Plants that possess an internal transport system for water and food in the form of xylem and phloem cells.

Population: Any group of individuals, usually of a single species, occupying a given area at the same time; groups of organisms with homologue (same) alleles.

P. **Cycle**: Changes in the numbers of individuals in a population which repeatedly oscillate between periods of high and low density.

P. **Density**: allowing a mathematically precise reflection - P_D.

- absolute: P_D = number of individuals/unit area or volume [$1/m^2$] or [$1/m^3$]
- relative: P_D allows only a simple comparison (P_D <, =, >, ≥ etc.).

P. **Dynamics**: The variations in time and space in the sizes and densities of populations; distribution due to changing food resources - the stability of a population depends upon abiotic factors, intraspecific competition (density dependent), natality, mortality etc.

P. **Ecology**: The study of the variations in time and space in the sizes and densities of populations, and of the factors causing those variations.

P. **Fluctuation**: Variations over time in the size of a population.

P. **Growth**: Is zero, when the birth rate equals the death rate (see carrying capacity).

$N_{T+1} = N_T + r$ N_T, current number of individuals

r = (natality + immigration) - (mortality+emigration) r, intrinsic rate of growth (see density)

P. **Pyramid**: A means of illustrating the age structure of a population diagrammatically, by placing the youngest age class at the base and stacking successive age classes above it.

P. **Regulation** : A tendency in a population for some factor to cause density to increase when it is low and to decrease when it is high.

N_T, momentary number of individuals
N_0, Number of individuals at start
t, time
r_m= spec. reproduction rate

Natality: Rate of birth = number of born individuals / time

$N_T = N_0 \cdot e^{r_m \cdot t}$

Mortality: Death rate = Number of dead individuals over time (see carrying capacity). Natality and mortality graphs together form the life table (see there).

Predator: An organism that consumes other organisms, such as true predators, grazers, parasites, and parasitoids etc.

Grazer: A consumer which attacks large numbers of large prey during its lifetime, but removes only a part of each prey individual, so that the effect although often harmful, is rarely lethal in the short term, and never predictably lethal; e.g. cow, mosquito, etc.

Keystone P.: Is the wedge-shaped block at the highest point of an arch. Its early use in food-web architecture referred to a top predator that has an indirect beneficial effect on a suite of inferior competitors by depressing the abundance of a superior competitor. Removal of the keystone predator, just like removal of the keystone in an arch, leads to collapse of the structure (= true predator).

True P.: Utilizes a prey organism by killing some to many of them:

- Parasites: An organism that obtains its nutrients from one or very few host individuals, causing harm but not death immediately (obligate, facultative parasitism).
- Parasitoids.: Insects (mostly wasps and flies) in which the adults are free-living, but eggs are laid, on or near an insect host (or rarely, a spider or isopod), after which the parasitoid larva develops in the host (itself usually a pre-adult), initially doing little apparent harm, but eventually consuming and killing the host before or during the pupal stage.

Predator Prey Systems: Prey community can flourish if more dominant than the predator, otherwise crash;

- Optimal foraging theory (entscheidungsregel - a caterpillar chooses a leaf by approaching, trying one or moving on to the next before eating).
- A symbiotic relationship in which both species benefit; either facultative (one or both species in a mutualistic association may survive and maintain populations in the absence of the other partner), or obligate (the mutual relationship with other species is essential for the species to survive).
- Comensalism: A relationship between two species in which one species benefits and the other suffers no apparent harm.

P.P. **Oscillations**: Seasonal, periodic fluctuations of supply and demand, e.g. growth rate of hares and lynxs, (boom and crash oscillations).

Prey: An individual liable to be, or actually, consumed (killed) by a predator.

Productivity: The rate at which biomass is produced per unit area by any class of organisms(see biomass).

Resiliance: (see community stability).

Resistance: (see community stability).

Resource : That which may be consumed by an organism and, as a result, becomes unavailable to another, e.g. food, water, nesting sites, CO_2, minerals solar energy,etc.

R. for autotrophs: light, water, minerals, CO_2, O_2 (at night) space, etc.

R. for heterotrophs: Consists basically in the food chain provided (see there).

Sustainable R.:

Generalist: Utilizes resources as they are available, e.g. a rat consumes as much as the provided.

Specialist: Utilizes a certain spectrum of resources available, regardless weather in abundance or limited supply, e.g. koala-, panda bear etc.

Selection: Individuals best suited to an existing environment will survive and reproduce to a greater extent.

K-S.: Selection of life-history traits which promote an ability to make a large proportionate contribution to a population which stays close to its carrying capacity (K)-the traits being broadly, large size, delayed reproduction, iteroparity, a small reproductive allocation, much parental care, and the production of few but large offsprings.

R-S.: Selection of life-history traits which promote an ability to multiply rapidly in numbers-the traits being broadly, small size, precocious reproduction, semiparity, a large reproductive allocation and the production of many but small offsprings.

Sigmoid Curve: S-shaped characteristic, or growth graph (see selection).

Specialist: (see resource).

Species: In taxonomy, a group of organisms whose members have the same structural traits and who can interbreed with each other.

Local S.: Tendency of a community to return to its original state when subject to small perturbations.

Keystone S.: Top predator effecting the prosperity of organisms lower in trophic level (see predator).

S. **Diversity**: Community diversity that takes into account both species richness and the relative abundance of species = diversity index (D) minus number of species (N) plus relative abundance ( ).

S. **Richness**: The total number of species in a community (depends on biogeographical conditions).

Succession: The orderly progression of changes in a community composition that occurs during development of vegetation in any area; from initial colonization to the attainment of the climax typical of a particular geographic area.

Micro S.: A dying tree, for example forced by winds to break causes a successional chain of events (also known as degrative succession. - see mosaic climax).

Autotropic S.: A temporal succession of species location principally involving plants.

Allogenic S.: A temporal succession of species at a location that is driven by external influences which alter conditions (contrary to autogenic); e.g. silt deposits changes a marshland to woodland.

Autogenic S.: A temporal succession of species at a location that is driven by processes operating with the community (contrary to allogenic), e.g. primary and secondary succession, that occur on newly exposed land.

Degraditive S.: Degradable resources (feces, dead organisms) are utilized successively by a number of species; there is a link between succession on plant litter and soil formation.

Heterotrophic S.: A temporal succession of species at a location, principally involving animals.

Primary S.: Soon after a region is denuded, a variety of pioneer species begin to colonize the bare ground and they modify the environmental conditions (e.g. a retreating glacier, early organisms provide the soils needed by succesing organisms - facilitation).

Secundary S.: follows major changes to an established ecosystem. Catastrophic weather events, fire, or human activities all disturb the environment. After such an event on land, well-developed soil remains, giving pioneer species an easy foothold, but also on abandoned agricultural areas.

Order of S.: Once an ecosystem is established, succesion does still take place on a smaller, slower, more complex scale.

- **degrative** OoS.: Dead organic matter (feces etc) trigger a succesional change of decomposing organisms until substance is completely recycled.
- **interactive** OoS.: Interaction between species, e.g. herbivores in an habit; birds feed on caterpillar - too many caterpillars feeding on leaves can decrease competitiveness of plant, in which the bird lives.

Theories of S.: Disturbances in ecosystems open up an area with the following scenarios:

- facilitated: Only certain pioneer species are capable of becoming established in the open space, but if certain species can exist and establish as adults under prevailing conditions, so that either can be:
- tolerated: modification of the environment by early occupants has little or no effect on subsequent recruitment of later successional species, or
- inhibited: occupants by early organisms make it less suitable for recruitment of late successional species, e.g. *Ulva sp*.

Survivorship Curve: A plot of the declining size of a cohort, or presumed cohort, as the individuals die, usually with time on the horizontal axis and $\log_{10} l_x$ on the vertical axis (where l_x is the proportion of the original cohort still alive - see life table).

Type I (convex**)**: describes the situation in which mortality is concentrated at the end of the maximum life span; e.g. humans in rich countries.

Type II (straight**)**: indicates that the probability of death remains constant with age, and may well apply to the buried seed banks of many plant populations.

Type III (concave**)**: indicates extensive early mortality; e.g. many marine fish which produce millions of eggs of which very few survive to become adults.

Type IV (holometabiolic**)**: Determined by metamorphosis and their survivorship by camouflage; usually oscillate around the type-II pattern; e.g., insects going through complete change from larvae, pupa, to insect;

Symbiosis:(Gk. sumbiosis, companionship) The living together of two organisms of different species.

Commensalism: Members of the two species in which one member benefits and the other is neither benefited nor harmed.

Mutualism: Relationship between 2 species beneficial to both (e.g. host = plant; symbiont = bee).

Parasitism: One member (parasite) lives in or on the living body (epi-/endoparasite) of a plant or animal (host) and obtains its nourishment at the expense of the host.

Thermic: (Gk. thermos, hot) of, using, producing, or caused by heat.

Heterothermic: (Gk. heteros, ??) Body temperature fluctuate between Homeo- and poikilothermic.

Homeothermic: (Gk. homos, same) Warm blooded; generate so much heat within itself that they can raise its body temperature significantly (such animals can maintain a constant internal body temperature, also named **endothermic**.

Poikilothermic: (Gk. poikilos, varied) Cold blooded animals, as well as plants whose body temperature fluctuates with that of the environment; also named **ecto-**, or **exo-thermic**.

Transpiration: The loss of water from plants by evaporation, mainly through the stomata on stems and leaves.

Trophic Level: (Gk. trophos, feeder) A step in the movement of energy through an ecosystem, represented by a particular set of organisms (see biomass).

Autotrophic: An organism that is independent of outside sources for organic food materials and manufactures its own organic material from inorganic sources.

Heterotrophic: An organism with a requirement for energy-rich organic molecules from outside (animals, fungi and most bacteria).

Vorous: (L. voreare, to devour) Eating or feeding on.

Carniv.: (L. carnum, meat) An animal that eats the flesh of other animals.

Detriv.: (L. detritus, decay) An organism that takes energy from dead or waste organic matter.

Herbiv.: (L. herbum, plant) An animal that consumes plants as food.

Omniv.: (L. omni, all) An animal that consumes both plant and animal matter as food.