Ecosystem

Ecosystem

Types :→ Endoparasite → More → Extreme specializ
(Lungs, Liver, kidney, R.E)
e.g ⇒ Taenia, Ascaris, Entamoeba, Plasmodium

Ectoparasites

Ectozoo parasitic
- Tick on dog
- Human lice
- Copepods on marine fishes
- Leech on cattles

Ectophyto parasite
- Aphids (Plant lice)
- Lac insect
- Red cotton Bug

Other types :→

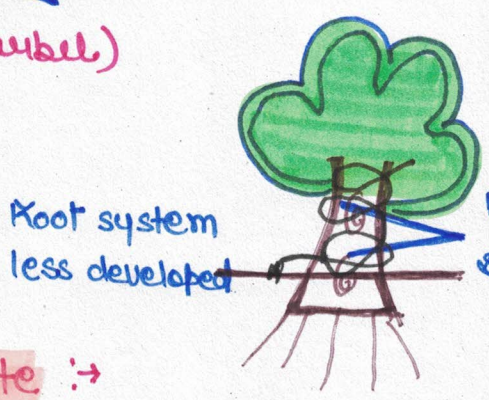
Hyperparasite

e.g:- Organism → Bacteria
(Parasite)
Bacteriophage
(Hyperparasite)

Holoparasite

a) **Total stem parasite :-**

e.g. Cuscuta (Amarbel)



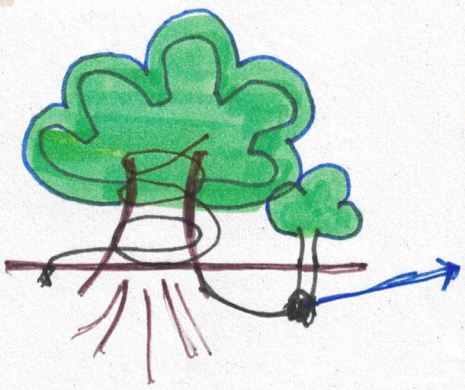
Leaves & chlorophyll degenerate

Root system less developed

Haustorial Roots
↓
sucking Roots
- Food
- Mineral
- water

b) **Total Root Parasite :→**

e.g. Rafflesia
↓
Largest flower



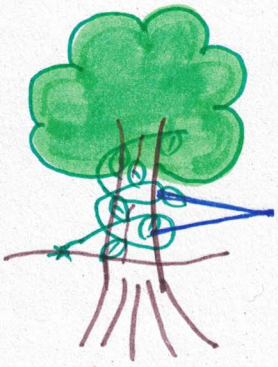
Haustorial Root
- food
- Mineral
- Water

Hemiparasite

a) Partial stem parasite :→

Parasite		Host
Loranthus	-	Mango
Viscum	-	oak

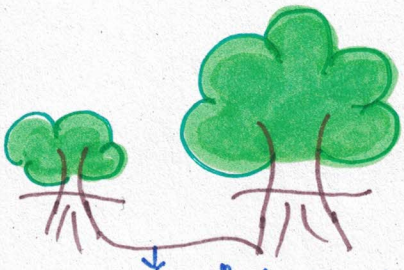
Leaves and chlorophyll developed



Houstorial Root
→ Mineral
→ Water

b) Partial Root Parasite :→

E.g :- Santalum (chandan)



Houstorial Root

Blood Parasitism

(Nest/egg) eg. Cuckoo + Crow

- Mosquito (♀) , Human foetus have true parasitism.
- Female mosquito is not a true parasite because it does not take shelter on human body.
- Human blood is not achal nutrition for female mosquito , it uses blood for body warming and egg incubation (Heat provide)
- Human foetus is not a true parasite because it does not cause big harm to mother.
- It does not take life time shelter.
- Generally , parasitism occur in interspecific interactic but it is not interaspecific interaction.

Adaptation

i) Less of unnessary sense organ
ii) Presence of Hooks and Suckers
iii) Less of digestive System
iv) High Reproductive potential

Note

1) HUMAN LIVER FLUKE
   - Human
   - Snail
   - Fish

Primary ← Human → Snail → Fish

Secondary Host / Intermediate Host.

2) Malarial Parasite :-
   - ♀ Masquito
   - Human

Predation (Catch, Kill + Eat)

⇓

Eating by Hunting

Deer → Tiger

Deer ⇓ Prey ⇓ Small

Tiger ⇓ Predator ⇓ Large

Seed ⇓ Embryo ⇓ (Complete life)

Sparrow ⇓ Predator

> "Trophic level represent functional level not a species"

Significance

1) **Energy flow** :→ Predators act as a "Conduit" for energy transfer across trophic levels.

Predation → Predation → Predation

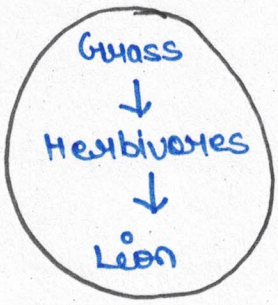
Grass → Rabbit → Wolf → Lion

Energy: T_1 → T_2, T_2 → T_3, T_3 → T_4

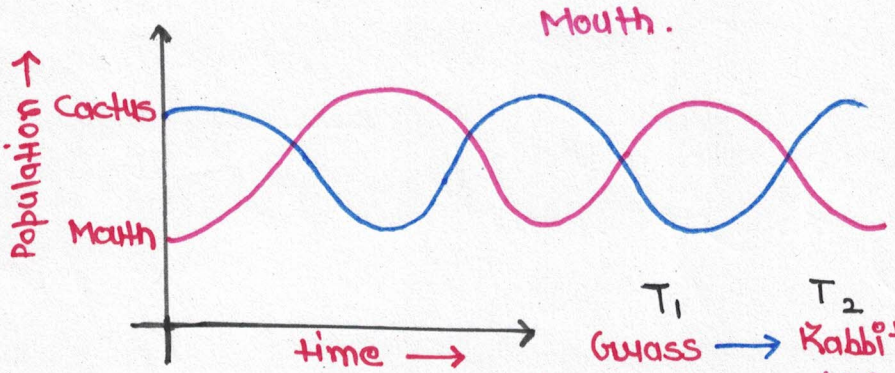
Trophic level :→ Specific function position of an organism in food chain.

Maintain Ecosystem Balance

By keeping prey population under control.



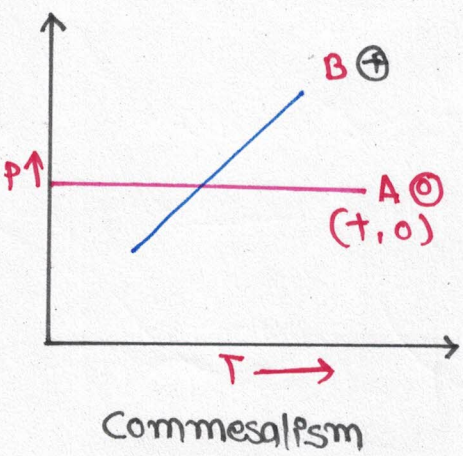
Eg. Australia (1920)
↓
Prickly pear cactus
↓
Natural predator absent
↓
Growth ↑↑
↓
It causes havoc in millions of hector Rangeland (Grassland)
↓
Cactophagus
↓
Mouth.



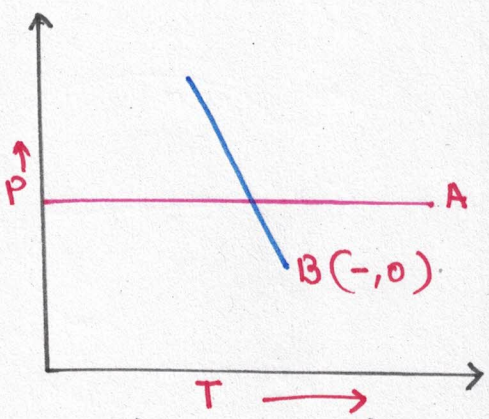
T_1 Grass 1000000 → T_2 Rabbit 100 ↓ 200 → T_3 Wolf 10 → T_4 Lion 1

Note

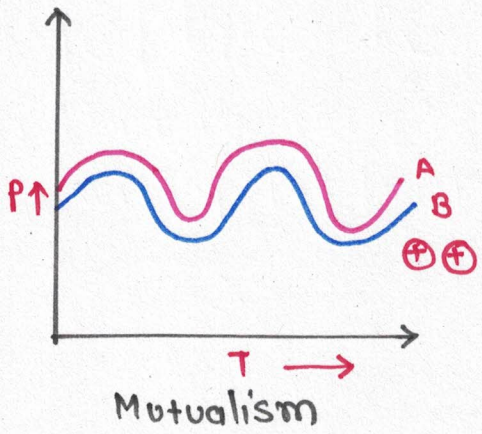
- At any trophic level number of organisms depend on no. of organisms at previous trophic level / available food.
- Long termed stability of an ecosystem / food chain depend on predation.



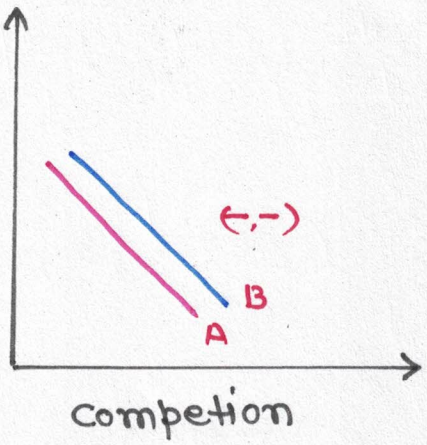
Commensalism



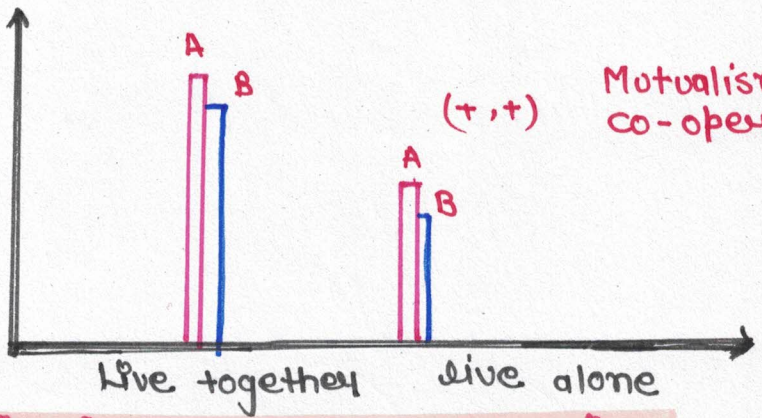
Ammensalism



Mutualism

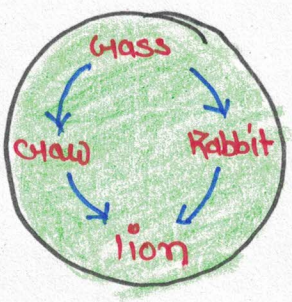


Competion



Mutualism ≥ also Proto co-operation

(iii) **Maintain Ecosystem Diversity** :→



By reducing competition among prey population.

Predators are "Prudent" (समझदार) in Nature.

⇓

They do not overexploit their prey.

E.g.:→ American pacific coast

↓

Rocky intertidal Area

↓

Predator - starfish - Pisaster

↓

Experimentally - Remove

↓

10 invertebrate species extict with in a Year due to heavy Interspecific competition.

Biological control methods :→

Principle = Predation

e.g. Gambusia control Mosquito by eating Mosquito larva.

Hawk control Birds.

Defence :→ Animals

Camouflaged ↓ Cryptically coloured → Frog, Insect

Monarch Butterfly → Highly Distasteful Predator = Bird → Caterpillar Stage → Eat seed of poisonous weed

Plants

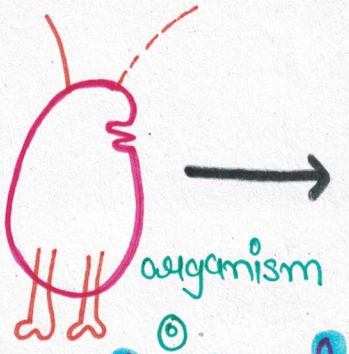
Total discovered → 22% plants, 70% Animals

i) Acacia opuntia → Thorns

ii) Calotropis → Cardiac Glycosides

iii) opium Papaver somniferum, Caffein caffea arabica, Nicotin Nicotiana, Quinine chinchona, Strychnine etc Nux vomica

Amensalism



Antibiosis

Fungi → Penicillium notatum Secretes → Penicilline Kill → Staphylococcus Bacteria

BGA — Microcystis → Hydroxyl-amine → Aquatic Animals (fishes)

Green Algae — Chlorella → Bacteriocides → Bacteria

Allelopathy

e.g Parthenium grass

↓

Carrot grass → Transcinnamic acid → Casia tora, Vinca regia } Plant

↓

Congress grass

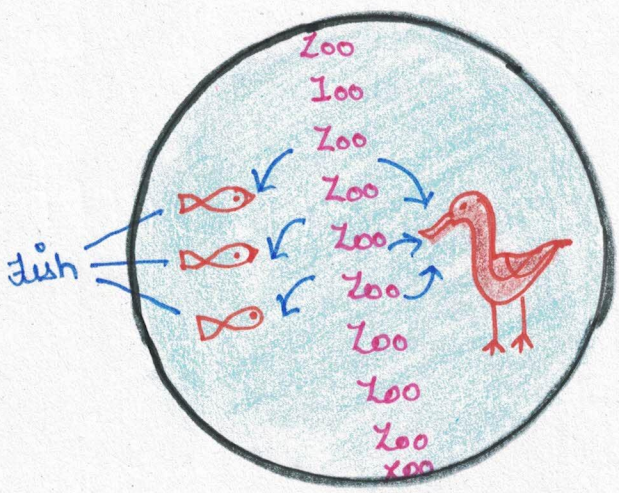
sunflower, ocimum, Barley } weed free crop → smooth crop.

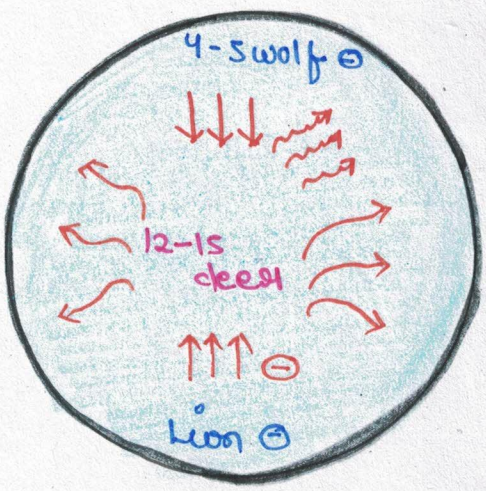
* Autopathy : eg. Silver Oak

Competition

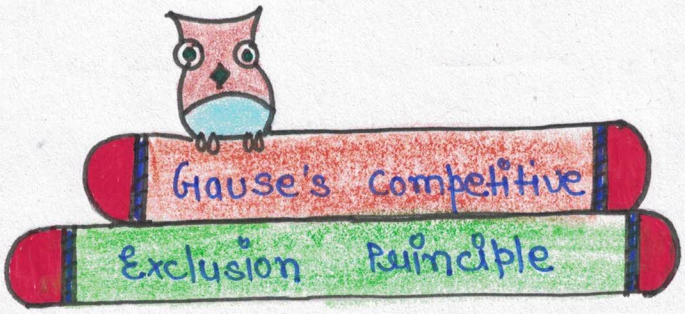
- Intraspecific competition
- Interspecific competition

e.g ⇒ South America → Shallow water lake





Interference Competition



Resources limited → Two species → Long time

↓

Superior

↓

Inferior → Remove

↘ Extinct → Abingdon Tortoise → Goat Introduced

↓

Herbivour = Grazing

Resources limited → Tortoise extinct with in a decade

Interspecific competition is a potent force in organic evolution.

REMOVE

Scotland → Rockey intertidle Area

↓

Conell's experiment →

Two species ← Barnacle

Balanus — Large

Chathamalus — small

↓

Inferior

↓

Remove

★RESOURCE PARTITONING★

Resource unlimited

↓

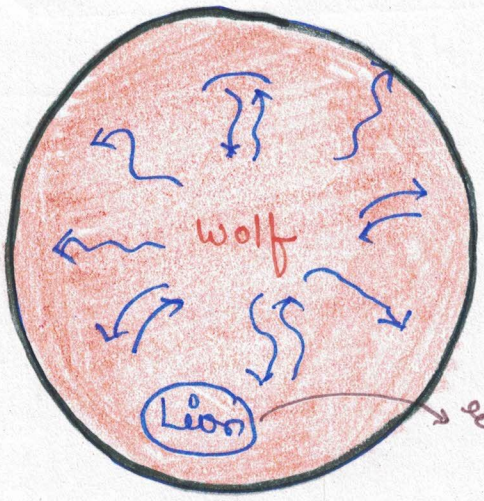
Niche overlapping

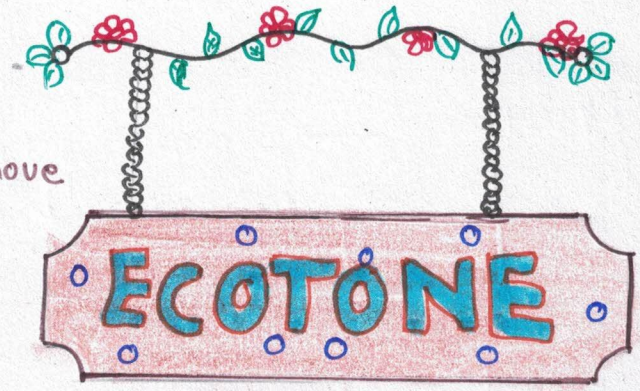
e.g Max Arthur :-

Warbler Birds → 5 species

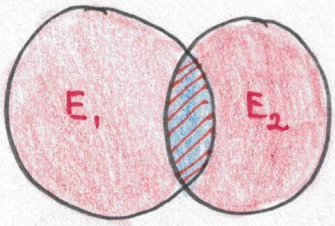
Co-existance.

COMPETITIVE RELEASE

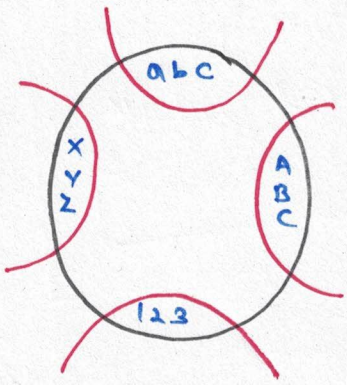


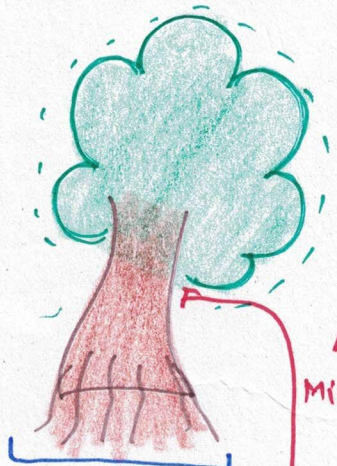


Eg:→ Littoral Zone
Estuaries = Fresh water organism + Marine water organism
Wet Lands = Terrestial + Aquatic

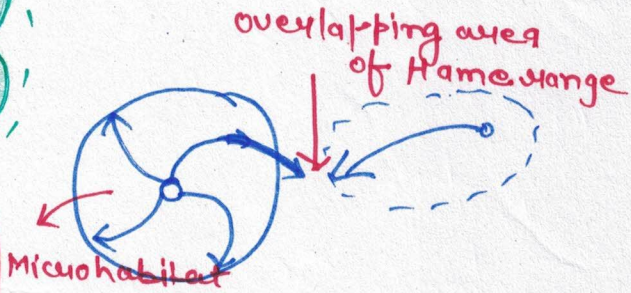


EDGE EFFECT





eg. Birds



Mismaclimate

ECOSYSTEM

Ecosystem may be :→

- Natural or Artificial (Man-made)
- Complete or Incomplete
- Permanent or Temporary
- Large (Megaecosystem) or small (nanoecosystem)
  eg → Ocean eg :→ Drop of water
- Natural eco → complete → Permanent → self sustain, self maintain
  - Terrestrial eg. Forest, Desert
  - Aquatic eg. Pond, Lake, River, Ocean.
- Artificial → Incomplete → Temporary → Human support
  eg. Cropland, Garden, Aquarium

Karl Mabins ⇒ Bio (living) coenasis (group) ⇒ community

Biogeocoenosis ⇒ ecosystem

Structure

Biotic

Producers ⇓ Autotrophs

Consumers ⇓ Heterotrophs

Animal + Microbes

Macroconsumer
- Primary cons.
- Secondary cons.
- Top cons.

Micro consumer ⇓ Decomposers e.g Bacteria, Fungi

Abiotic

Light, temp, soil, H_2O, Air

Functions of Ecosystem

Productivity
Energy flow
Decomposition
Biogeochemical cycle

- Essential biotic component of an ecosystem → Producers and microconsumers.
- Ecosystem is smallest structural and functional unit of nature.

Macroconsumers / Animals / Phagotrophs / Holozoic

Primary consumer

Directly depend on Green Plants

Herbivore

e.g :→ Rabbit, Deer, Goat, cow, Insect, Zooplanktons Rat, etc

Secondary consumers

Depend on Primary consumers

Carnivores

e.g :→ Wolf, frog, snake, fox, Dog, cat, fish, etc.

Top consumers

They can eat other but not eaten by other.

e.g :→ Lion, Hawk, shark, Tiger eagle, crocodile vulture, Peacock Human etc.

T_1	T_2	T_3	T_4
Producers	1°	2°	3°(x) Top

Special Point

1. Plant Parasite
   ⇓
   Cuscuta, Rafflesia etc
   ⇓
   Pri. consumers

2. Animal Parasite
   ⇓
   eg. Leech
   ⇓
   Sec. consumers.

3 Insectivous Plant

= Carnivore Plant

= Predator Plant

eg. Negenthes, Utricularia, Drasera etc.

4 Sparrow, Cow, Cockroach

Sparrow → seed (1° cons.), Insect (2° cons)

Nepenthes → Photosynthesis ⇓ Producer; Insect eating ⇓ sec. consumer

Cow → Bread (1° cons.), Rat (2° cons)

Cockroach → 1° cons, 2° cons.

QUESTION

Nepenthes is a ?

1) Producer
2) 1° consumer
3) 2° consumer
4) ✓ Both (1) & (2)

5 Human

1° cons , 2° cons , Top cons.

i) Plant (T_1) → Man (T_2)

ii) Grass (T_1) → Goat (T_2) → Man (T_3)

iii) Grass (T_1) → Rabbit (T_2) → Wild (T_3) → Human (T_4)

6 Milk & Milk Product

Grass → Cow → Man

Grass → Cow → Mo. X

Milk → Bacteria → Mo. X

इस food chain से ऐसा लग रहा है कि consumer को Mo. X curd नहीं Bacteria खा रहा है इसलिए हम यह Prefer नहीं करते।

Whale -

Phytoplanktans → Zooplanktons → whale ⇓ Sec. consumers

Lion ⇒ Always top consumer

Grass → Rabbit → Wolf → Lion

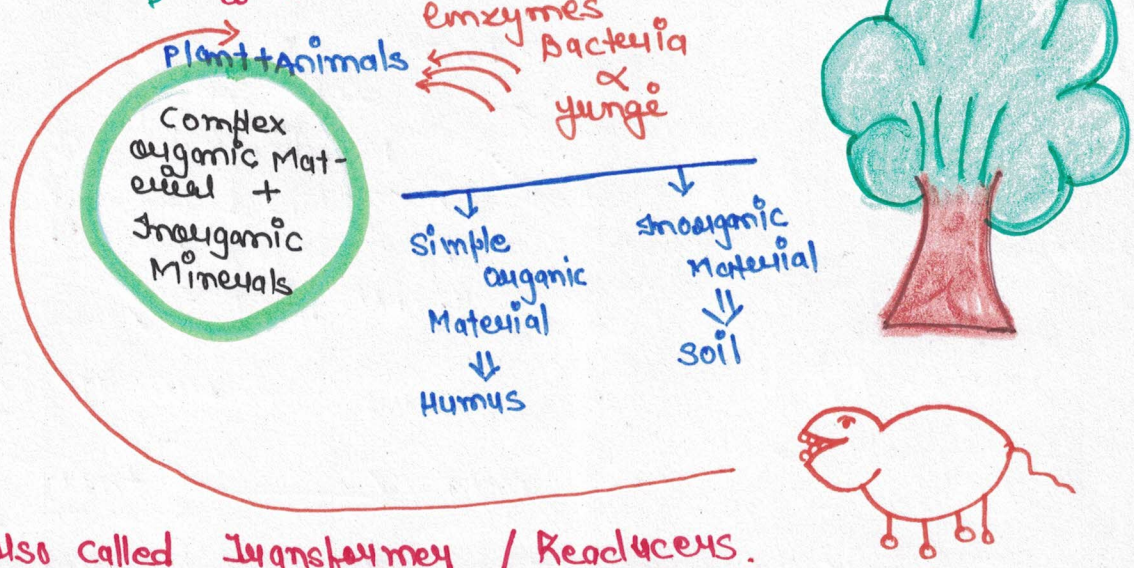
Grass ⇓ Producer ⇓ 1° producer

Rabbit ⇓ 1° cons ⇓ 2° producer

Wolf ⇓ 2° cons ⇓ 1° carnivore

Lion ⇓ Top cons. ⇓ Top carnivore

Microconsumers / osmotroph



⇒ Also called Transformer / Reducers.

Nutrient Immobilization

In the process of decomposition some nutrients get tied up with the biomass of microbes and become temporarily unavailable to other organism. Such incorporation of nutrient in living microbes (bacteria & yeast) is called nutrient immobilisation.

Food Chain

Sequence / arrangement of organisms according to their food habit.

Grass → Rabbit → wolf → lion

TROPHIC LEVEL

- specific functional position of organism in food chain.
- Trophic level represent functional level not a species

T_1 Grass → T_2 Insect → T_3 Frog → T_4 Snake → T_5 Peacock

T_1 Grass → T_2 Rat → T_3 Snake → T_4 Hawk

T_1 = Producer
T_2 = 1° consumer
T_3 = 2° consumer
T_4 = 3° / Top consumer

Long food chain = Not good
3-4 trophic levels = Healthy food chain

⇓

Energy transfer from one trophic level to another trophic level occur according to 10% Energy transfer law of Lindeman.

(Trophic kinetic concept / Energy flow)

Tropic kinetic Concept

T_1 Grass → T_2 Rabbit → T_3 wolf → T_4 Lion

100 kcal —10%→ 10 kcal —10%→ 1 kcal —10%→ 0.1 kcal

100 kcal: ↓ −90%
Resp = 20%
other metablic Activities = 70%

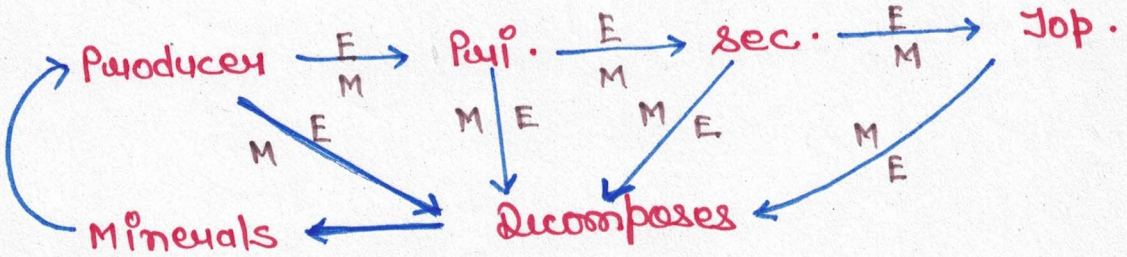
10 kcal: ↓ −90%
Resp = 30%
OMA = 60%

1 kcal: ↓ −90%
Resp = 60%
OMA = 30%

$T_1 \longrightarrow T_4$

% age energy transfer = constant (10%)
Amount of energy = ↓se (100 → 10 → 1 → 0.1)
Respiration % age = ↑ (20 → 30 → 60 %)
Trophic level Biomas = ↓se
Size / Biomas of Ind. organism = ↑se
Producers = Ecological strongest
Top consumers → Ecological weakest
Physical strong

T_4 Lion → T_5 Decomposes
0.1 Kacal → 0.01 kcal
↓
Millions of Bacteria
↓
Negligible energy
↓
Not sufficient for their survival



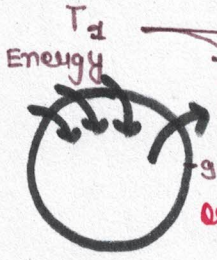
** Mineral flow = cyclic **
Energy flow = Unidirectional

Law of Thermodynamic

FLOT

Sun → Producers → Consumer → Heat energy
↓
light energy → chemical energy → Mech

SLOT



Molecules ⟶ Randomness ↑ = Entropy = Disorderness ↑

TYPES OF FOOD CHAIN

(1) Grazing food chain (GFC) = Predatory food chain

Small Producer ⟶ Large producer

T_1 Grass ⟶ T_2 Rabbit ⟶ T_3 Wolf ⟶ T_4 Lion

Phytoplanktons ⟶ Zooplanktons ⟶ Small fish ⟶ Large fish

(2) Parasitic food chain (PFC)

Large producer ⟶ Small Consumer

Tree ⟶ Birds ⟶ Parasites

(3) Detritus food chain (DFC)

Terrestrial  ⟶ Bacteria & Fungi ↑ x ↓

Detritus T_1 T_2

Aquatic :→ In Aquatic DFC = GFC get connected with DFC

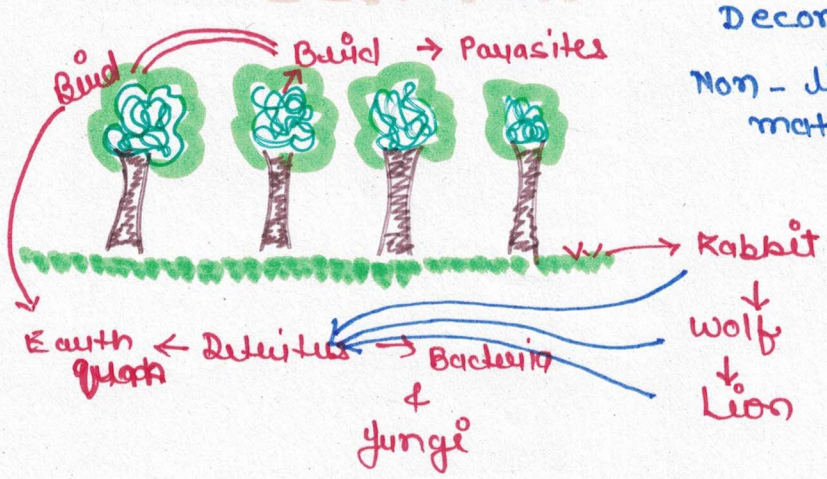
Detritus → Bacteria ⟶ Larva or Molluscs & Nematodes ⟶ Small fish ↘ Large fish / Bird

Sundarbans / Mangroves / Swampy

Fungi & Bacteria ⟶ Larvae ⟶ Small fish ↘ Large fish / Bird / Tiger x

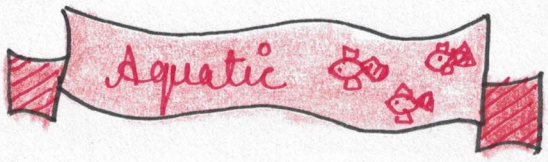
Detritus

Terrestrial



Decomposers ↑

Non-living material > living material



Difference between GFC & DFC

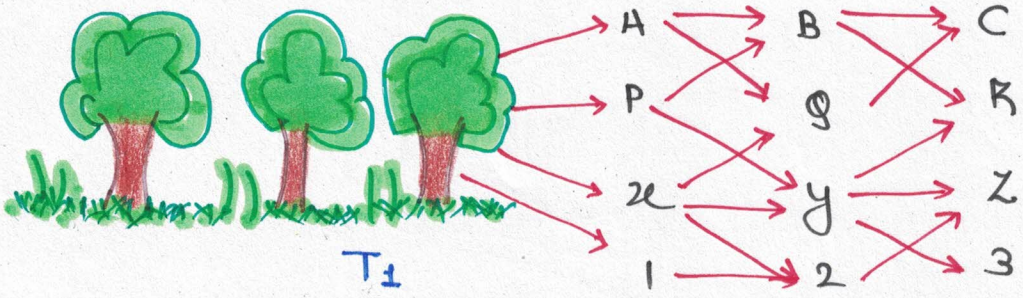
GFC

- Start from producers
- Directly depend on green plant.
- Decomposers are absent
- 10% law applicable
- Major conduit
  ↓
  Aquatic
- Energy flow = fast

DFC

- Start from detritus.
- Indirectly depend on green plant.
- Decom are present.
- 10% law not applicable
- Major conduit
  ↓
  Terrestrial
- Energy flow = slow

Food Web



No. of species ↑
=
Biodiversity ↑ → food web → Complex ∝ stable

eg ⇒ Tropical Rain Forest

Biodiversity ↓
Productivity ↑ → less impact of alien species
→ less year to year variation in Biomass

Paul Ehrlich ⇒ "River popper Hypothesis" → Airplane Rivets wings.

No. of species ↓
=
Biodiversity ↓ → Food web → Simple → less stable

eg - Arctic Tundra

Natural ecosystem → More stable → complex food web

Artificial ecosystem → Less stable → simple / food chain food web

Ecological Pyramids -

Def Graphical representation of some ecological parameters like - Number, Energy and Biomass.

⇓

Eltonian's Pyramids.

Demerit :- Food chain is the base of his representation but we know food chain does not exist in nature.

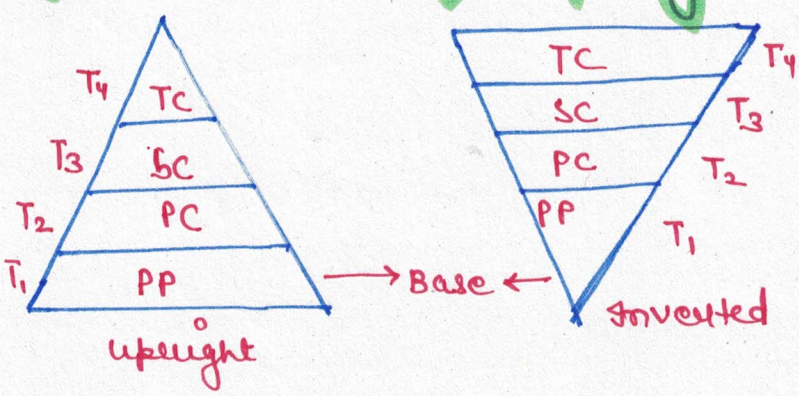
T_1 (Grass) → T_2 (Rabbit) → T_3 (Wolf) → T_4 (Lion)

Number - 100000 — 100 — 10 — 1

Energy = 100 kcal — 10kcal — 1kcal — 0.1kcal

Biomass ⇒ 120 kg — 80 kg — 60 kg — 20 kg

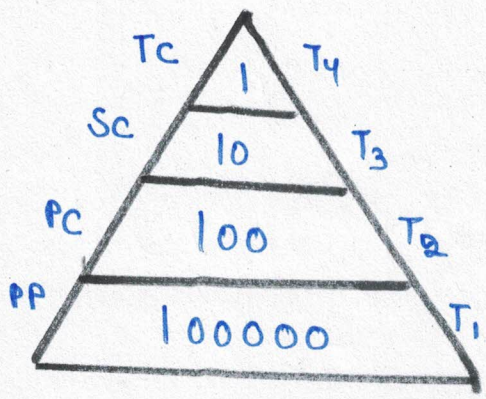
Types of pyramid

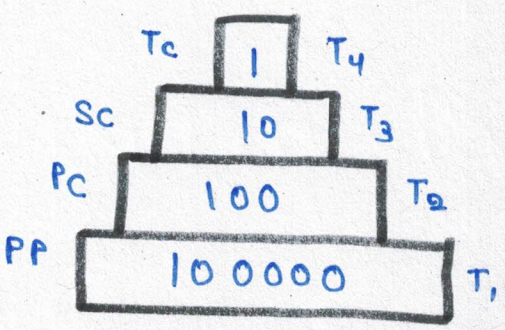


[A] Pyramid of Number :-

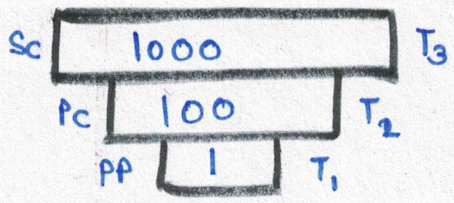
(1) Grassland - Grass (T_1) → Rabbit (T_2) → Wolf (T_3) → Lion (T_4)

Number = 100000 — 100 — 10 — 1



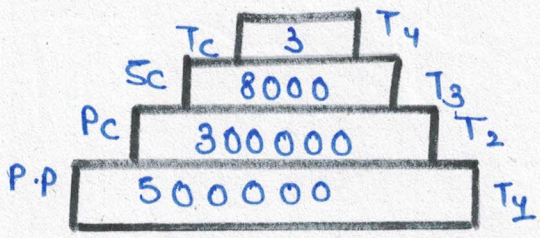


(2) Tree Ecosystem :- Tree → Birds → Parasites
1 100 1000

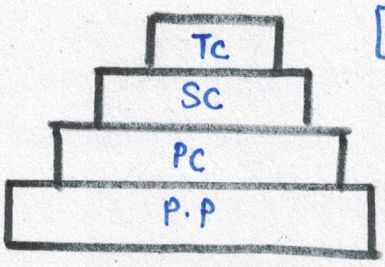


Note:- Parasite food chain
↓
Number Pyramid
↓
Always Inverted

(3) Aquatic Ecosystem :-
Phytoplanktons → Zooplanktons → Small fish → Large fish
Number ⇒ 50,0000



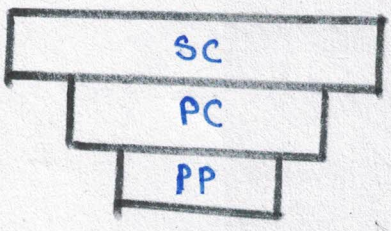
(4) Forest Ecosystem :-
P.P → P.C → SC → TC



[Tree
Shrubs
Herbs etc]

(5) Tree Dominating Forest :-
Tree → Birds → Parasite

Upright pyramid of Number absent in –
(1) Pond
(2) Grassland
(3) Forest
(4) Lake



(6) Tree → Insect → Small Bird → Large Bird
1 500 10 2

Demerit :→ Decomposers is absent in pyramid of energy. So, 10% law applicable. Pyramid always upright.

[B] Pyramid of Energy

Decomposes absent

↓

10% law applicable

↓

Higher trophic level → energy decrease

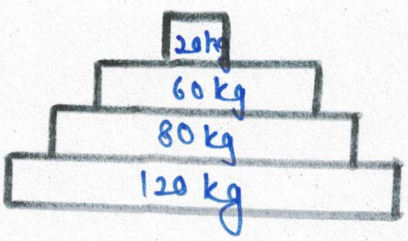
↓

Always upright (Energy pyramid)

[C] Pyramid of Biomass

1) Grass land Ecosystem :→

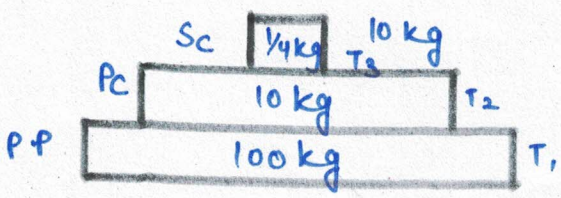
T_1 Grass 120 kg → T_2 Rabbit 80 kg → T_3 Wolf 80 kg → T_4 Lion 20 kg



Note :- All the pyramids in grassland are upright.

2) Tree Ecosystem

Tree 100kg → Birds 10kg → Parasites 1/4 kg



SPECIAL POINT

- Most of pyramid are upright.

But, Inverted < Tree = Number
Aquatic = Biomass

- Pyramid of Number represents ⇒ Biotic potential
- Pyramid of Biomass represents ⇒ standing crop.

Standing Crop Total amount of living organic material present area per unit time.

Class
- 200 student
- 100 kg
- 200 200 kg
  - ⇓
  - fresh H_2O water
  - ⇓
  - 2000 kg
  - ⇓
  - Dry weight
  - ⇓
  - More accurate

T_1 → T_2 → T_3 → T_4

T_1	T_2	T_3	T_4
Grass	Rabbit	wolf	lion
120 kg	80 kg	60 kg	20 kg

Productivity

Energy = kcal / m^2 / yr

Mass = kg / m^2 / yr / g/m^2 / yr (gm^{-2} yr^{-1})

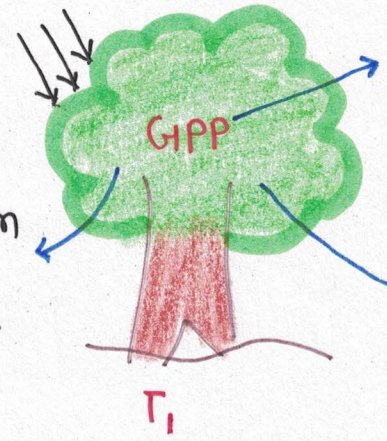
Rate of Biomass formation / unit area / unit time

- Primary productivity ⇓ Producer
- Secondary productivity ⇓ Consumer

GPP
Gross pri. productivity

NPP
Net Pri. productivity

ISP
Incident Solar Radiation

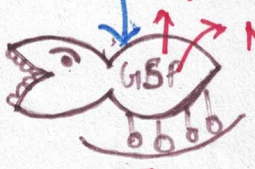


Respiration + Metabolic

T_1

Total photosynthesis
Total organic food formation
Total energy fixation
Rate of New biomass formation

NPP
10%
↓
NCP
(Net community productivity)



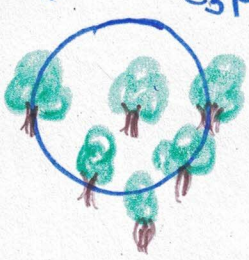
T_2

NPP = GPP − R (R = respiration)
GPP = NPP + R
NCP = NPP − HR (HR = Heterotrophs)
NCP = NPP - GSP

CROP LAND

Sugarcane > Rice = Succession →
↓ ↓
C_4 plant C_3 plant
NCP → decrease

i)



Plant = constant
Animal = Increase
$\frac{P}{B}$ = Law

ii) Seral
100 kcal
50% (50 kcal / 50 kcal)

Climax
200 kcal
45% (110 kcal / 90 kcal)

GPP − R + HR = NCP

NOTE :→ Ecological efficiency = Trophic level efficiency

$T_1 \xrightarrow{\%\ =\ ?} T_2$

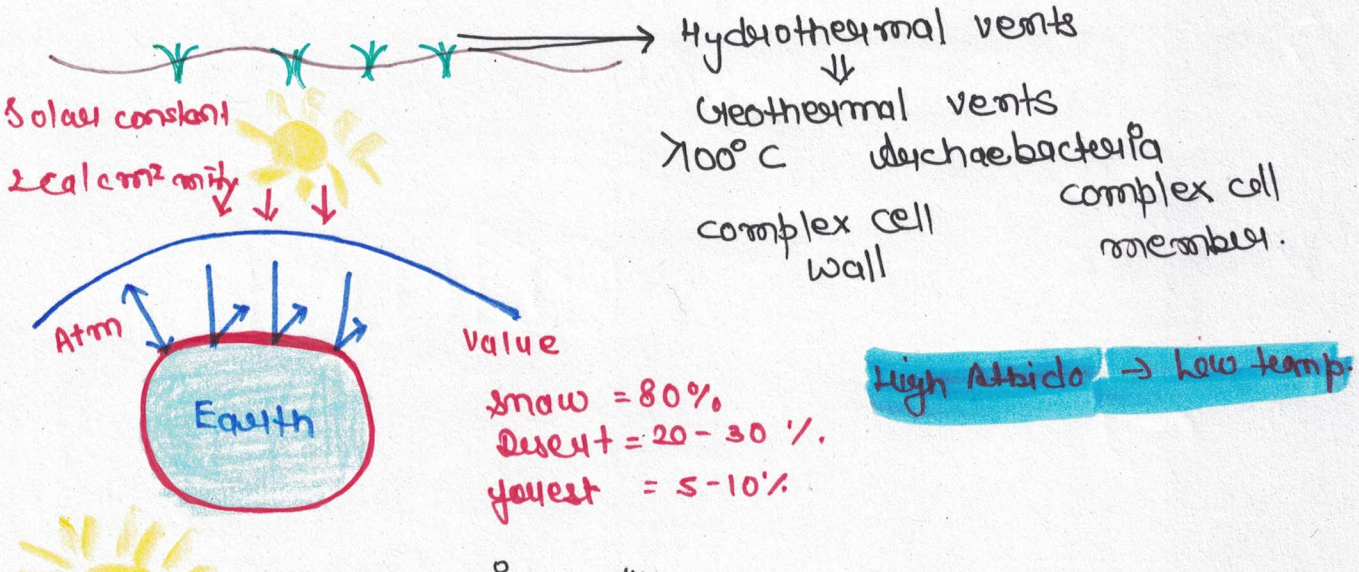
$Ee = \frac{T_2}{T_1} \times 100$ —— $Ee = \frac{GNSP}{GPP} \times 100$

⇒ Photosynthetic Efficiency ⇒ $Pe = \frac{GPP}{ISP} \times 100$

Abiotic factors

[A] Light ⇒ Mostly effect → Productivity

Green Algae | Brown Algae | Red Algae



Hydrothermal vents
⇓
Geothermal vents
>100° C
Archaebacteria
complex cell wall
complex cell membrane.

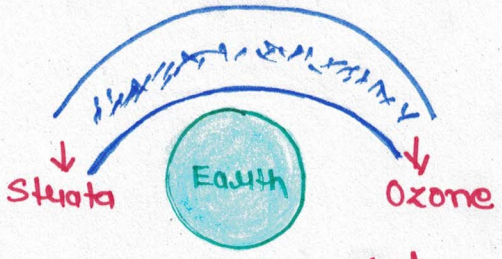
High Albido → Low temp.

Other Light UV
Cosmic
X - Ray
γ - Ray
Infra Red Ray

100 - 400 nm
→ UVC - 100 - 280 nm
→ UV - B - 280 - 320 nm
→ UV A - 320 - 400 nm

Visible light
(400 - 400 nm)
PAR
↓
Photosynthetic Active Radiations
2 - 10 % Photosynthesis.

UV C = 100 - 280 nm ↓↑ E ↑ → Host lethal



$O_3 \xrightleftharpoons{UVC} O_2 + O$

UV B = 280 - 320 nm → Harmful → Living organism.

Skin cancer (Halanama)
Mutation
Snow blindeness
Xeroderma pigmentosum

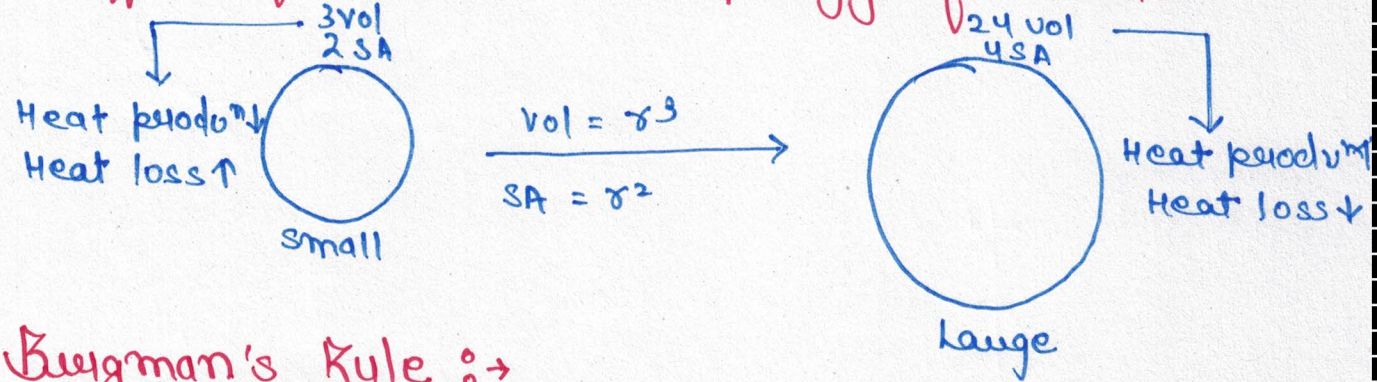
UVA ⇒ 320 - 400 nm = Not much harmful, because it's A get near to visible.

[B] Temperature Most effect → Diversity & Distribution

i) Effect of temp^{r} on plant :-

- Desication - High temp^{r} → Transpiration ↑ → Dryness
- Chilling injury High temp^{r} → Low temp^{r} → cells damage
- Freezing injury - low temp^{r} → Ultra low → Ice crystal formation

ii) Effect of Temp^{r} on morphology of animals:-



Bergman's Rule :→

Cold area → Body Size ↑

Warm area → Body Size ↓

eg ⇒ Desert Lizard

Note:- Camel → Physiological adaptation

ALLEN'S RULE

Cold area ⟶ Body size ↑ → External Body part e.g Tail, limbs, Ears, snout, wings etc.

Warm area ⟶ Body size ↓ → Ext. body part - large.

iii) Effect of temp° on physiology :→

Acclimatisation - Internal / Metabolic / Physiological change according to changing environment.

i) Attitude sickness - Atm. pressure ↓ O_2 ↓

Symptoms : Nausea, Fatigue, Heart palpitation

Adjustment :- RBC count increase

HbO_2 binding capacity decrease

HbO_2 releasing capacity increase

Breathing Rate increase.

ii) Antarctica fishes -

Antifreezing protein

↓

Glycerol

↓

Body fluid

↓

Freezing point decrease.

iii) Cold Area

Ice nucleating proteins

↓

Ice layer formation

↓

Work as a Heat insulator.

iv) whale & seals
↓
Thick fat layer
↓
Blubber

v) kangaroo Rat -
Release concⁿ urine → ↓se H_2O loss
fat oxidⁿ → Biproduct → H_2O

PLANTS

1) OPUNTIA
Stem → Thick, flat fleshy green
Leave → spines

2) Calotropis & Nerium
Thick cuticle
Sunken (Deep) stomata
Hypostomic leaves.

3) Prosopis - Pinnate compound leaves.

Physiological adaptation

- CAM pathway → Scotoactive stomata
  - Day → Close
  - Night → Open
- High temp^r area - plants → cells → Proline & sorbitol → Cell O.P ↑ → ↓se H_2O Loss
- High temp^r area plants → Presence of chaperonines → Heat shock protein → Extra Body Heat → Body temp^r ↓se

Behavioural Adaptation

Migration
⇓
Area Escape
⇓
Thermal Migration

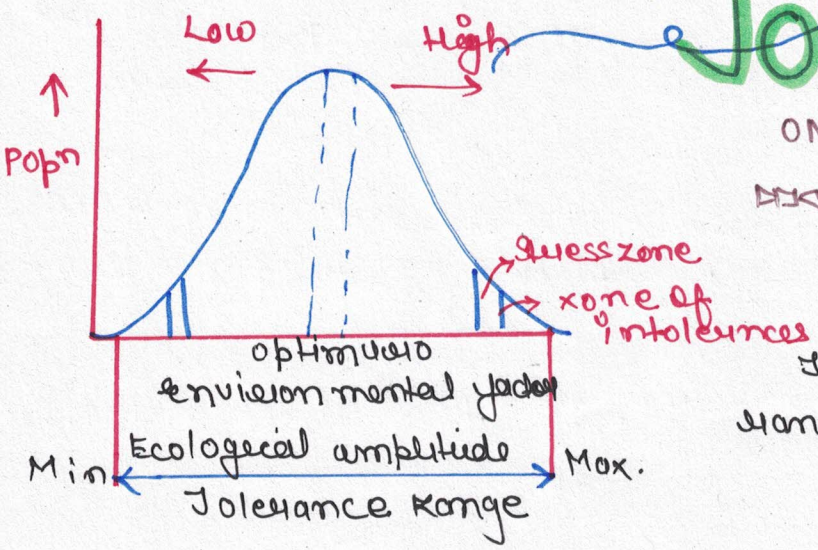
Arctic tern
Siberian cranes
caribou
Bison
Salmon fish

Suspension
⇓
Time escape

Hibernation — Winter sleep — ⇓ Polar Bear (upto 6 month)
Astivation — Summer sleep — ⇓ Frog
Diapause — stage of suspended development

i) Selaginella - (Drought escapers)
ii) Spores of lower plants
iii) seed dormancy
iv) Zooplanktons

Shelford's Law of Tolerance



ON the basis of Temp^{r}

- Eury thermal / warm blooded / endothermal / Homeothermal
  ↓
  They can tolerate wide range of Temp^{r}
  ⇓
  Thermoregulation
- Steno thermal / cold blooded / ectothermal / poikelothermal
  ↓
  They can't tolerate wide range of temperature.

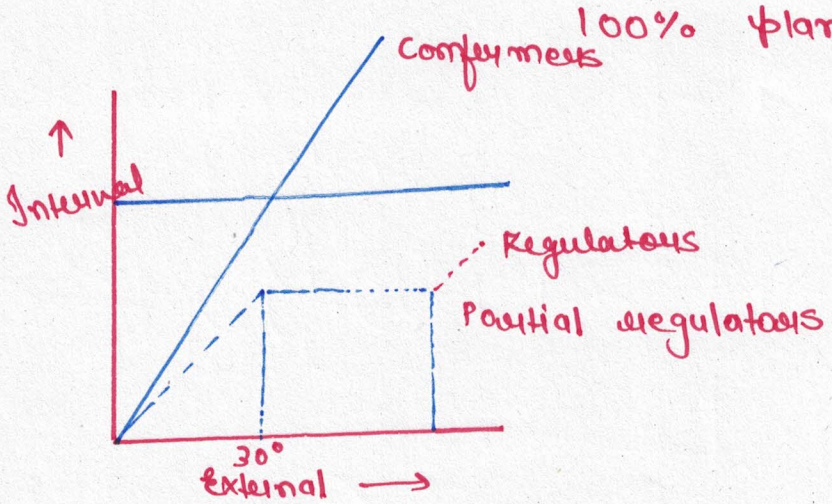
Euryhaline → can tolerate wide range of salt conc^{n} (osmoregulation).

Eg → fishes of estuaries.

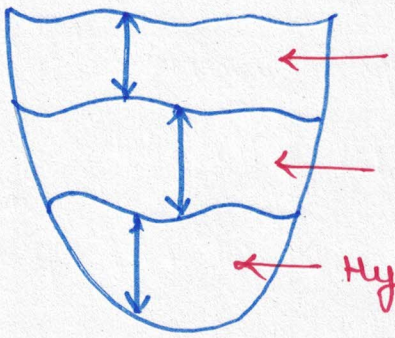
Stenohaline → can not tolerate wide range of salt concentration.

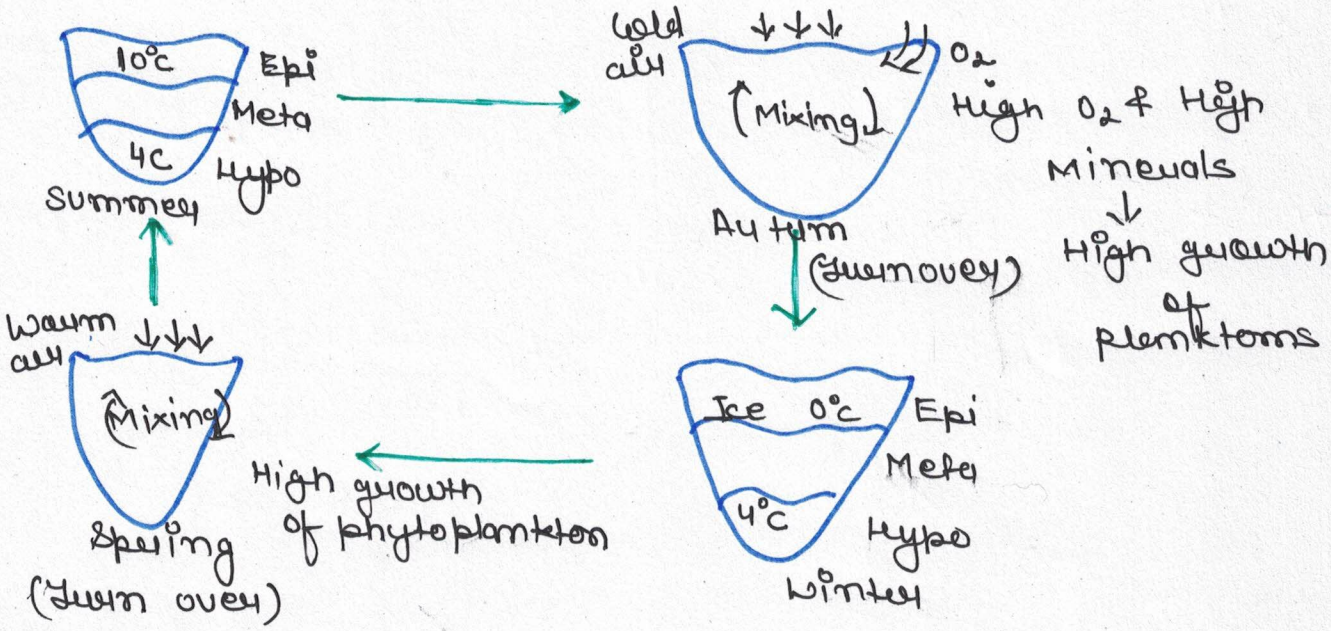
Eurythermal (thermoregulation)
and
Euryhaline (osmoregulation)
↓
Regulators (1% animals)

Stenothermal
and
stenohaline
↓
conformers 90% animals
100% plants.



Thermal Stratification in Case





1 year

→ Stratification < summer. / winter

→ Turn over < Autumn / spring

Soil

Soil related factors = Edaphic factors

study = Pedology

Formation = Pedogensis

↓

Bidirectional

In 45% Inorganic Minerals →

Clay → < 0.002 mm

Silt → 0.002 - 0.02 mm

Fine sand → 0.02 - 0.2 mm

Course sand → 0.2 - 2 mm

Gravel → 2 - 5 mm

Course Gravel → > 5 mm

Decomposition

Litter / Detritus → Duff → Humus

- Litter / Detritus → Undecomposed
- Duff → Partial decomposed
- Humus → complete decomposed

1) Fragmentation
   Detrivores
   Earth worm
   Termites
   Ants.

2) Catabolism
   1) Fragmentation
   2) Leaching
   3) Catabolism

Factors affecting decomposition

1) Temperature ↑ Decomposition ↑
2) Moisture ↑ Decomposition ↑
3) Lignine, suberine and chitin - slow decomposition
4) Aerobic / Aerobiosis - fast
5) Anerobic / Anaerobiosis - slow
6) Acidic soil (PH - 3.5 - 4) - slow
7) Towards Basic (PH 5.6 - 6.5) fast

Pedogenesis
↓
Bidirectional
- Decomposition
  - undecomposed
  - Partial decomposed
  - complete decomposed
- → Weathering
  - Complete weathered
  - Partial weathered
  - Unweathered

Soil Profile

S- profiles

O
A
B
C
D/K

Desert - 3 profiles

B
C
D/K

Detritus / undecomposed
Duff / partial decomposed
Dark coloured zone / Melanized zone
light coloured / zone of leaching
fine particle of rock / complete weathered
small rock particles / partial weathered
Big rock / unweathered.

Soil → Sedimentary
→ Transported ← By Air
By water.

WATER

Salt conc^n : ppt (parts per thousand)

Ocean = $\frac{30 - 35 \text{ salt}}{1000\ H_2O}$ Inland (fresh) = $\frac{<5^{-} \text{ Salt}}{1000\ H_2O}$

Hyper saline lagoons = $\frac{>100 \text{ salt}}{1000}$

BIO - GEO - CHEMICAL CYCLE

Plants
Animals
Microbes

Soil/Rock
water
Air

Gaseous
↓
Atm - CO_2
Litho - coal, Petrol
Hydro - carbonate

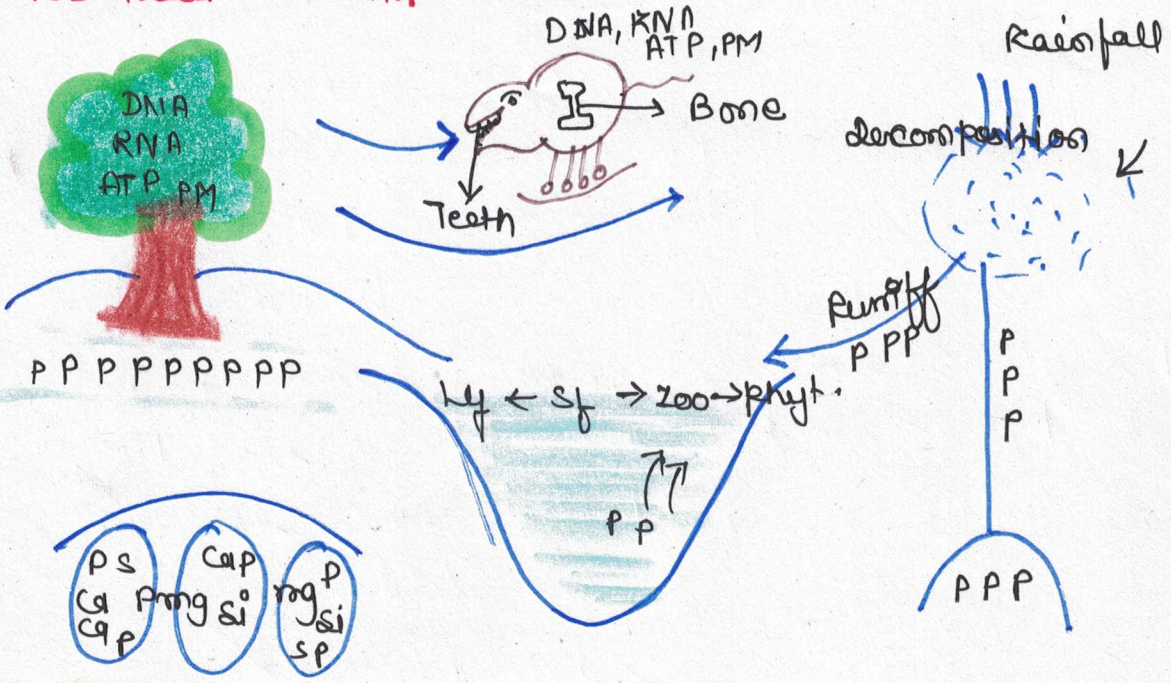
Mineral
P, S, Ca, Mg, Si
Reservoir = Earth crust
↓
Sedimentary cycle.

Phosphorous Cycle

Pure sedimentary cycle

↓

Reservoir = Earth crust



CARBON CYCLE

- Atomosphere :→ CO_2 ⇒ 1% carbon
- Lithosphere !→ coal, petroleum, limestone, Dolomite
- Hydrosphere !→ carbonate →71% carbon - ocean.