Handwritten Notes

on

Organism and Populations

☆ Animals can have adaptations to live in different habitat.

Date
Page

Organisms and Populations

Ecological Organisation

Sequence wise ascending ranking operating in living world

(Highest level)
- Biosphere / Ecosphere – Whole living zone of Earth (all terrestrial + aquatic biomes)
- Biome – Specific climatic condition, vegetation, fauna
  - Terrestrial (TRF) – high temp, high rainfall
  - Aquatic (Coral reefs)
- Landscape – Group of ecosystems (eg Indian peninsula)
  - large area, Natural boundry
- Ecosystem – self sufficient, regulated component of nature
  - Biotic + Abiotic ⇒ energy exchange, Recycling

size + complexity increases

1 Producer
2 Consumer
3 Decomposer

- Biological Community (different species interact)
  - Mutualism / Parasitism
  - Competition – Commensalism
  - Predation – Protocooperation
- Population – free flow of genes of same species individual

lowest level
- Individual (Basic unit)

- Habitat – (address)
  - eg. Hilsa fish (F.W & S.W)
  - Microhabitat – eg Pond
    - Edge: top of pond
    - Bottom of pond (different organisms)

• Sum total of biotic and abiotic factors of that area.

Ecological Niche — "Grinnel"

Work/Status of species in environment

- **Spatial niche** - Part of habitat occupied by individual

- **trophic** - functional role of organism.

- **multidimensional (hypervolume niche)** - range of environmental condition species an organism can tolerate

eg archaebacteria can survive 100°C pH 2

★ Two species NICHE cannot be same in same environment

↓ competition occurs

species diversity decrease

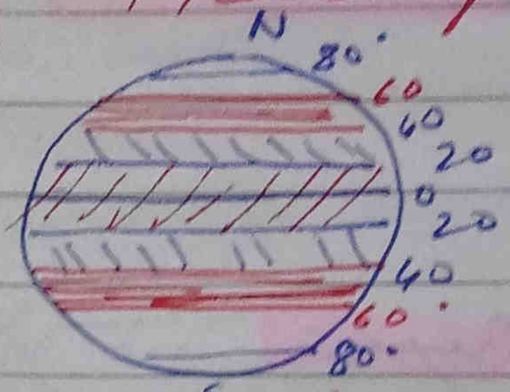
★ But species diversity should be maintained

↓ so

Niche should be generalised/specialised ✓

Climatic Zones

Latitude - on basis of changes in annual mean temp.

Climatic Zone	Latitude	Mean temp	Winter
1. Tropical Zone	0° - 20°	 > 24°C	(-nt) Nil
2. Sub Tropical	20° - 40°	17 - 24°C	Pleasant
3. Temperate	40° - 60°	7 - 17°C	Winter with snow
④ Arctic / Antarctic	60° - 80°	< 7°C	Prolonged winter

As latitude increases, temp. decreases

- Woody climbers that climb the tree in tropics = Lianas
- Drip tips protect the leaves from rainfall injury.

Similar climatic zones w.r.t ~~Latitude~~ Altitude

Tropical

Sub tropical

Temperate

Alpine

Q

MOUNTAIN

Climatic zones on mountain w.r.t Latitude

In temperate zone

2 Zones

Temperate

Alpine

LAPSE RATE

Temperature decreases by 6.5°C / 1000m altitude

11.7° latitude

INDIA

Biomes

Tropical rain forest

Annual mean T

@ 3-27°

Rainfal

2000-3500 mm

Ht - 30-40m

Key features

Dipterocarpus

Hopea

Lianas

eg

- Epiphytes (space parasites)
- Drip tips leaves
- Buttress roots (extra support roots
- Soil-Leaching ↓ loss nutrients in soil
- Miconhizal association

		Temp	Rain	Features
2.	Tropical Deciduous forest Ht. 10-20m	22-32°C	900 - 1600 mm	Sal, teak, teendu, Khair, Chiraunji Summer — leafless Rainy season — lush green
3.	Temperate broad leaf forest Ht - 25-30m	6-20°C	1000-2500mm	Oak species (eg. Quercus) Summer-leaf fall never leafless
4.	Temperate Coniferous forest / Needle leaf forest Ht - 30-35 m	6-15°C C	1700-3000 mm	Pine, Deodar, Cypress, Spruce, Silver fir } eg Numerous Lakes present
5.	Desert	<10 cm		Cold - Gobi, Leh Hot Succulent - Xerophytes eg. Euphorbia Shrubs, small trees eg. Prosopis, Acacia, Tamarix
6	Coastal /			Mangrove plants. Marshy area (Salty water, no oxygen) Pneumatophores / Aerophores / Respiratory roots (-vely geotropic eg - Avicennia, Sonneratia, Rhizophora

- H_2O is second most important factor after temperature.

Important elements of variation in physical & chemical conditions

○ Temperature (most imp): most ecologically relevant
| effects

- Enzyme kinetics
- BMA
- Physiological activities

4 Organisms on basis of Climatic Zones

1. Megatherms - Tropical zone
2. Mesotherms - Subtropical zone
3. Microtherms - Temperate zone
4. Hekistotherms - Can tolerate severe winter Arctic/Alpine Zone

Organisms - Temperature tolerance

Eurythermal (few)
can tolerate Large changes Heat

Wall lizard, toad
plant Artemesia
* Weeds

Stenothermal (large)
Narrow Heat
cannot tolerate large changes in temp

Snakes
Yew trees
* Palms
* Cereals

☆ Maximum temp fluctuation is seen in metalimnion

CLASSMATE
Date
Page

Laws associated with Temp

1. **Bergman's rule** — Warm Blooded Animals — Size - Cold areas > Warm areas
   Large
   (Surface area/Volume decreases in colder area)

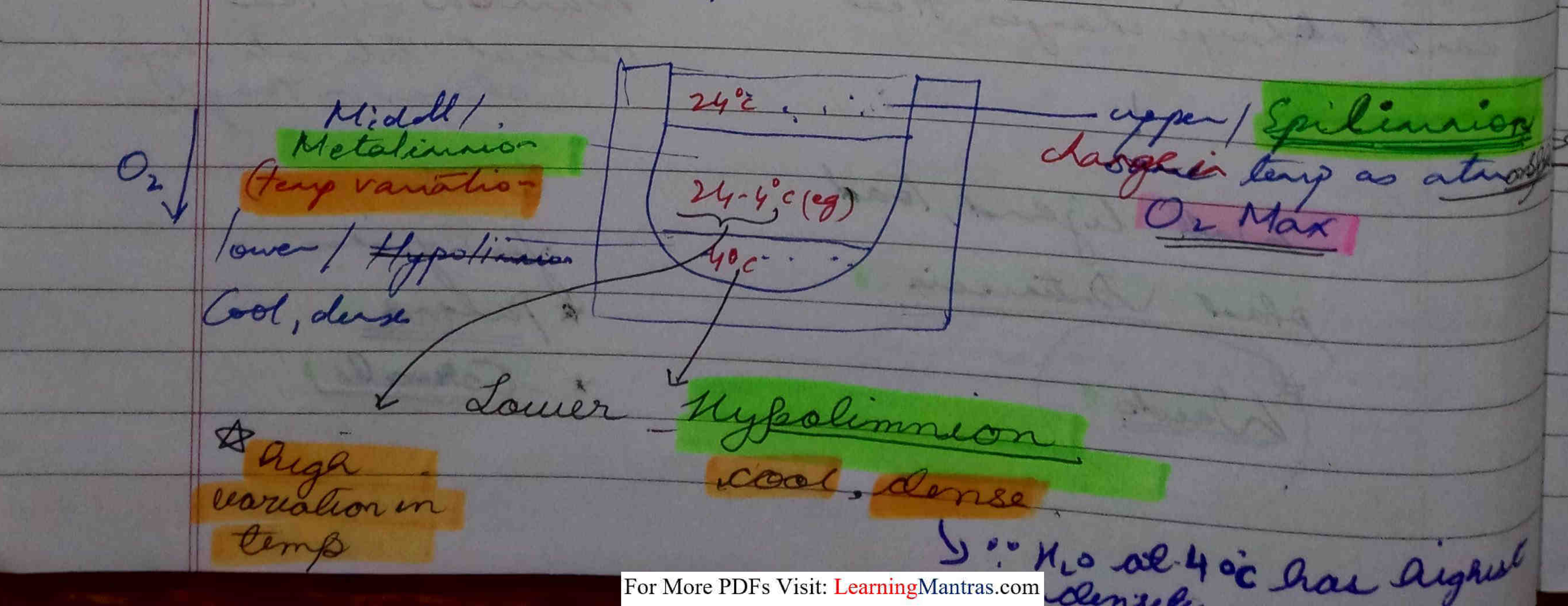
2. **Allen's rule** — WBA — Extremities - Ear, Mouth, legs, tails — Colder area small < Warm area
   (largest to reduce heat loss)

3. ~~Rapoli's rule~~ **Rensch's rule** — Birds — Wings — Cold - Narrow Wings; Warm - Broader Wings

4. **Jordan's rule** — Fishes — °Size, °No. of vertebrae — Colder area - large size > Warm areas
   Vertebrae more in colder areas > Warm areas

Thermal Stratification - deep water lake

Layers formation
as w.r.t to temp



ppt = parts per thousand

⇒ 2nd most ecologically important

Water - affects productivity of plant

71% Earth

97.5% Oceans

2.5% freshwater

Snow	Ground H2O	Rivers / Ponds / Lakes	Soil	Water Vapour in environment
78%	20%	0.8%	0.4%	1%

0.13 Geogra
1G = 10^{20} gram
↓
Cloud formation
Precipitation, Humidity
Dew formation

Salt concentration - Salinity ppt (p. per 1000)

Inland H_2O — Sea water — Hypersaline lagoons
↓ — ↓ — ↓
< 5 ppt — 30-35 ppt — > 100 ppt

Salinity tolerance

Can tolerate Wide range → Euryhaline
eg Fish, Salmon

Narrow range → Stenohaline
e.g. Eel

Both can survive in sea water and rivers

• Total UV C rays are absorbed in the atmosphere and only 50-1. of UV B rays are absorbed.

Light

Visible range of Electromagnetic Spectrum, it originates from sun, Solar radiation

at 83 km above earth (energy 2 cal/cm²/min SOLAR CONSTANT

Electromagnetic Spectrum

← Short wave radiations | light radiations | Long wave radiations →

Harmful (UV rays

- UVC 100-280 nm - Lethal
- UVB 280-320 nm - Quite harmful
- UV-A 320-400 nm Moderately harmful

→ Total
→ 50% absorbed by Ozone layer

Effects of Light

Plants

1. Photosynthesis
2. Reproduction
3. Growth
4. Movement
5. Flowering

Animals

Migration
Reproduction
Development
Pigmentation
Period of activity

- Compensation point: value of light at which rate of photosynthesis and respiration by plant is same
- BOA (Bacteria) can also survive in deep water

Date
Page

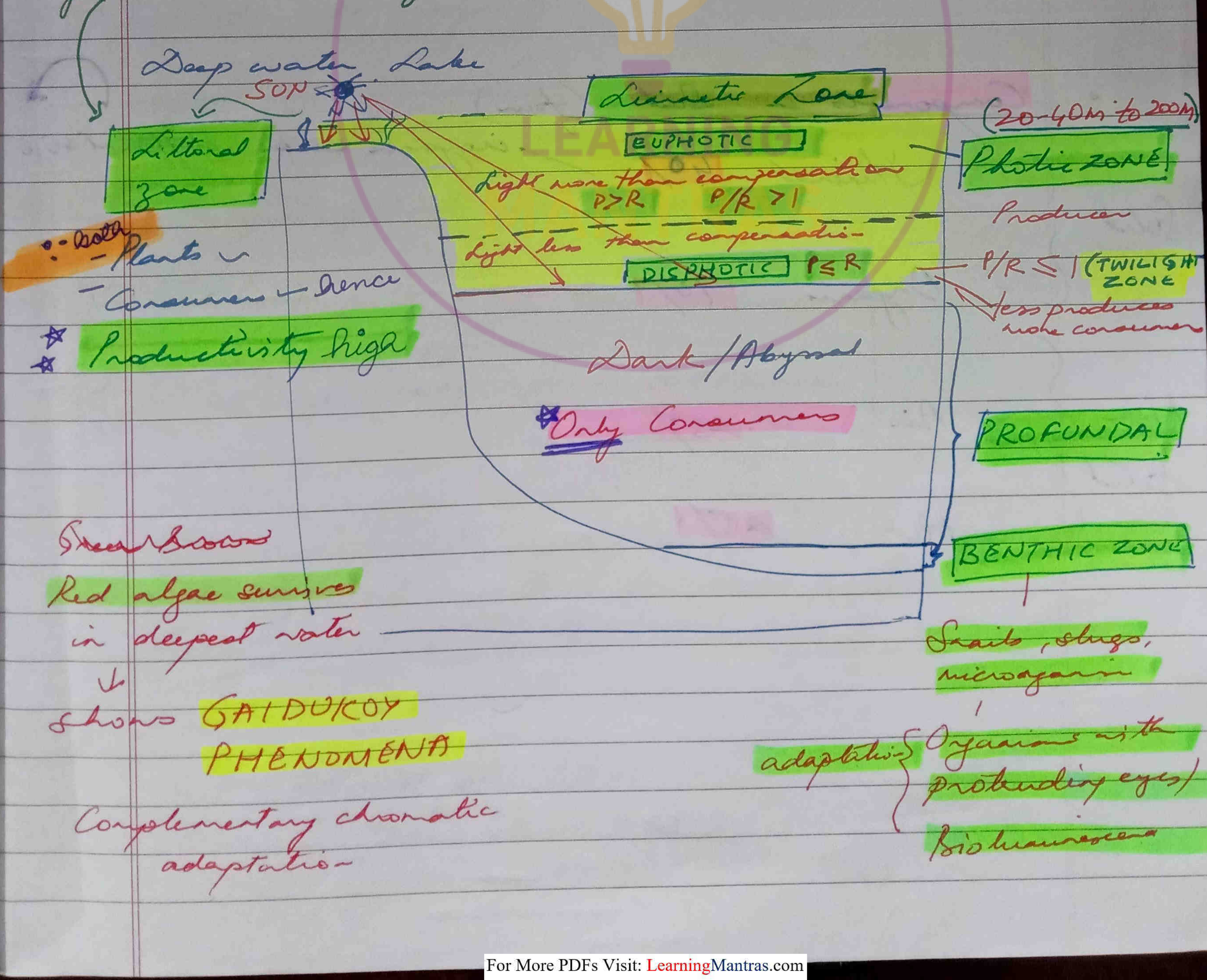
Light Zone

deep H_2O Lake

- Littoral Zone
- Limnetic Zone
  - Photic
    - Euphotic zone
    - Disphotic zone (Twilight zone)
  - Profundal: (Dark zone) (Abyssal zone)
    - also known as
  - Benthic

☆ In euphotic zone more producers less consumer but in disphotic zone more consumer less producers.

☆ Most diverse type of organism in Littoral zone.



Soil

Nature & Properties

Climatic

Weathering Process

Topography : surface configuration

* Residual or transported soil
  ↳ (In situ)

Particle size

- pH

- Running water - Alluvial soil
- Gravity - Colluvial
- Wind - Solian / Aeolian
- Glacier - Glacial Soil

A
0.1 - 3m
Top Layer
Humus ↑
Aeration ↑
B
1m
Subsoil
Transported soil
C
Aerator - Microbial activity
D

* Components in Soil (four)

Solid
- Mineral 40% — inorganic cubs. different size → Gravel, Silt, Clay
- Organic 10%

Non Solid
- Air - 25%
- H_2O 25%

O – A – B – D/R Horizon

classmate
Date
Page

Soil Profile

• **PEDON** - Smallest 3-D vol. of soil used to study Soil Profile

O – O_1 - Plant/Animal residue
O_2 - different stages of decomposition of Organic Matter

A
0.1 - 3M
Top Layer
Humus ↑
Aeration ↑

A_1 Dark (Humus) ↓ Fairly decomposed OM
A_2 Light ← Zone of Eluviation (Leaching) ★
A_3 (A+B) ← Microbial activity ↑

B
1M
Subsoil
Zone of deposition

B_1 Dark ↓ Humus - Finely " OM (Black, inorganic)
B_2 light ← Zone of deposition / Illuviation zone ★ (True Soil (Top + Sub) A + B)
B_3 B+C

C
Aeration-
Microbial activity

Aeration (-nt)
Microbial activity (-nt)

D

Parent rock material / Bed rock
Rock layer

→ Gravel	-	Small pebbles	- 2-10 mm
Sand		Grains of Quartz/SiO_2	- 0.02-2 mm
Silt		Fine "	- 0.002 - 2 mm
Clay		Fine hydrated Silicate (Al)	- < 0.002 mm

• Humus: is black, amorphous, has high water holding capacity and resistant to decomposition.
Also called store house of inorganic nutrient.

•

A_2 – Zone of elluviation
B layer – Zone illuviation

• Endotherms can remain active throughout the year.

Date
Page

Soil Profile

Temperate Deciduous Forest Soil	TRF soil
① O layer : Well developed	Thinner because rate of decomposition is fast
② A layer : Dark enhanced layer	Light - Pink * (due to leaching)
③ Deep - A layer - Shallow	Shallow
④ B layer - Sub layer B_1 B_2 B_3	X layer

• Organism's Response to Abiotic Factors

- Regulate - Homeostasis
- Conform
- Migrate
- Suspend

Internal env (regulation / Homeostasis)

External env.

Organism response to change in env.

1. Regulators

Body temp / Osmotic concentration

Endotherms / Homeotherms

Osmoregulators

Vertebrates - Bird, Mammal, Fish

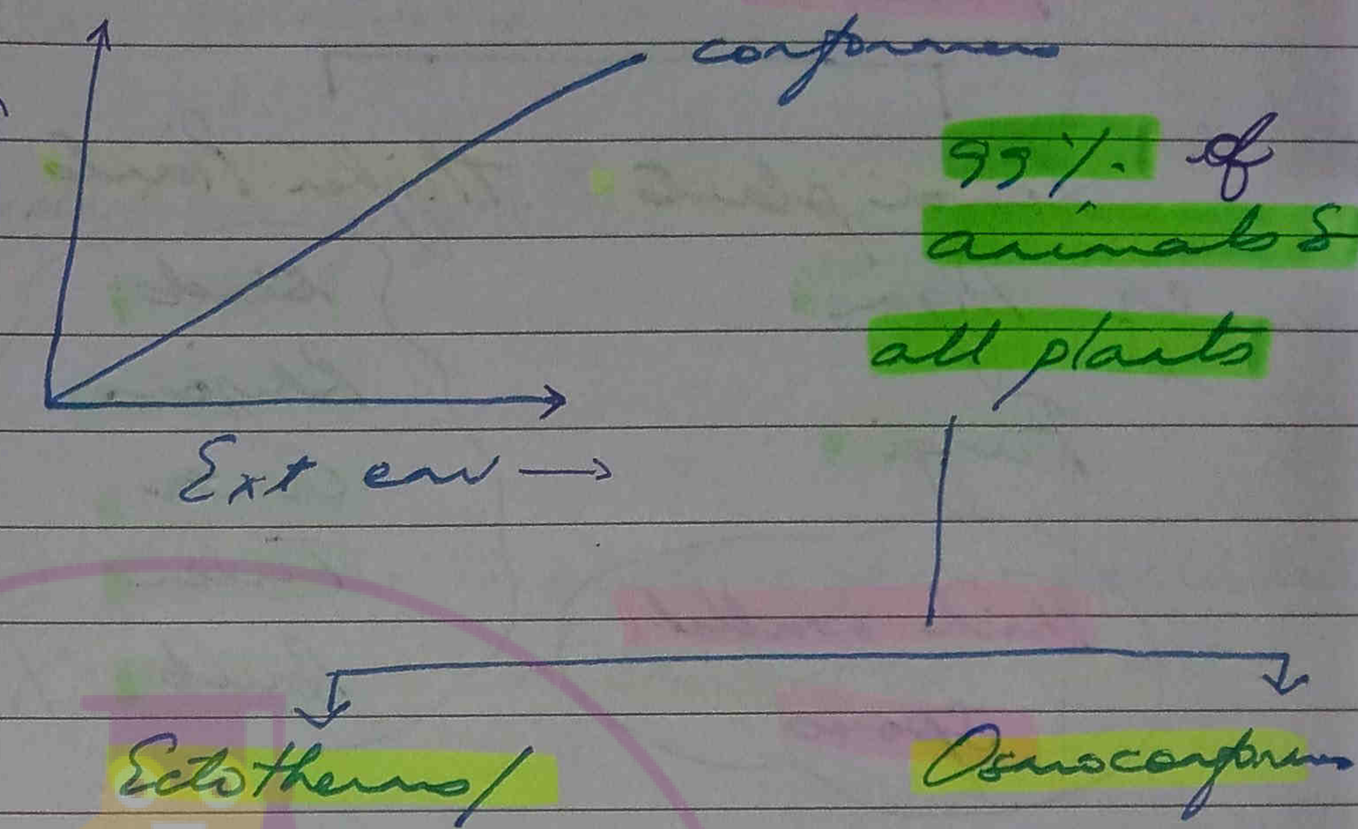
Invertebrates - few insects

Body temp is usually more than the external env. Optimum for enzymatic activity

Metabolism high 5 times more than Heterotherms

2. **Conformers** — Body temp & osmolarity changes with ext env.

not evolved to regulate as thermoregulation energetically is very expensive



99% of animals
all plants

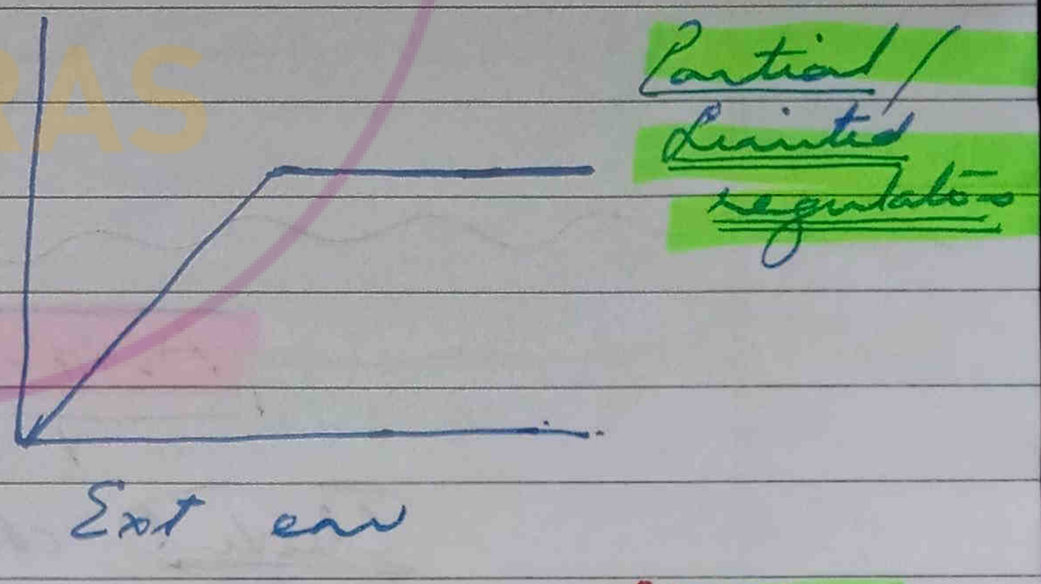
Ectotherms / Poikilotherms / Cold blooded organism

Osmoconformers

3. **Partial regulators**

Stress conditions for short term

Migration — Suspension



4 **Migration**

Daily
Birds for food

Periodic
At maturity
fish - spawning
Catadromous FW → SW
eg Eel
Anadromous SW → FW
eg Hilsa Salmon

Seasonal
Annual movement
Short dist
eg Whale
Cold → Warm
Long dist
eg Arctic Tern 17600 km
N. Pole → Antartica and vice versa in 1 yr
eg Bharatpur Keoladeo Nat. Park
In Winter Birds from Siberia & Nauthern Areas

Suspend (avoid unfav. condition
Suspend metabolic activities)

Plants

Lower plants
eg Algae
Fungi
Thick walled Spores

Higher Plants
Seeds
Rhizome
Corm
Tuber
Bulb

Animals

Hibernation
Winter Sleep

Aestivation
Summer Sleep

Diapause - Summer, Winter
(Break)
Zooplankton form cysts

TIDE
Temporary Interruption in Development of an Organism

Ectotherm
Frog

Endotherm
Squirrel

ADAPTATIONS

Useful changes in organisms (help in surviving & reproducing in its habitat

morphological, physiological, behavioural

ANIMALS' ADAPTATIONS

↓

① WATER SCARCITY — eg ① Kangaroo Rat survives in American deserts

(a) produces conc. urine
(b) Solidification of faeces
(c) Daytime → Burrows

(d) Seldom drinks H_2O

90% metabolic H_2O → Oxidation of fats → H_2O

10% food → dry seeds

(e) Retrieves moisture from exhaled air (NASAL COUNTER CURRENT MECH.)

② CAMEL → During H₂O availability drinks 80 lts of water in 10 min

a) dry faeces
b) conc. urine
c) metabolic H_2O
d) X urine in water distillers
- (e) has Nasal Counter current mechanism

..

② COLD REGIONS

eg ① Polar Sea Aquatic Organisms eg SEAL

Below skin ⇒ fatty layer (BLUBBER)

② ALLEN'S RULE → Extremities shorter

Warm blood organisms - Larger size S/V ↓

BERGMAN'S RULE ↗ (Surface Area / Volume → reduces)

③ PHYSIOLOGICAL ADAPTATIONS.

↓ which allow the organism to tolerate extreme cold conditions

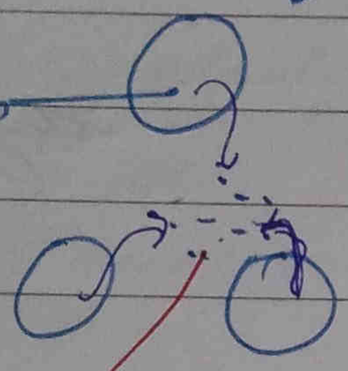
represents cold hardening.

- In cold hardening either ice nucleating proteins are used. (Freeze tolerant) or glycerol is used (freeze avoiding).

"Cold hardening"

(a) Freeze tolerant

Cells



Ice nucleating proteins present in extracellular spaces.

When ice formation takes place

↓

Water released from cell

↓

Solute conc increases in cell

↓

Prevents ice formation

(b) Freeze avoiding

↓

anti freezing chemicals in body fluids

↓

Ice formation prevented
Freezing point reduced
eg glycerol helps in reducing F.P.

eg Ice fish
Antarctic fish

(4) High temperature

eg- Microbes → Archaebacteria >100°C

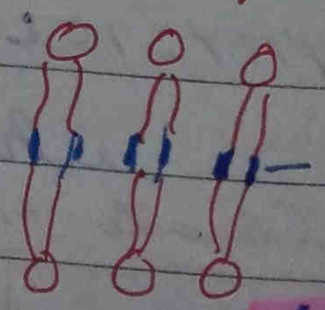
↓

Hot water springs

Deep Sea Hydrothermal vents

↓ work

- Have enzymes → high temp
- Plasma membrane → Lipid Bilayer



Join by covalent linkage

↓

Monolayer ⇐ form more stable membrane

Fishes → deep sea → can tolerate v. high press.

↓

100 times more than normal press.

(5) O_2 stress adaptation

High altitudes → less O_2 → Fatigue, Nausea, Heart palpitations } Altitude Mountain Sickness

Adaptation to overcome Altitude Sickness

↓ RBC count increases

↓ Breathing rate increase

* Binding affinity of Hb for O_2 decreases.

Behavioural changes —

eg. Desert lizard

Burrow

↓

Body temp decreases below comfort zone

↓

Comes out → basks in sun

↓ temp increases

Goes back to Burrow

Plant adaptation-

Xerophytes - Dry region

Hydrophytes - Aquatic region

Halophytes - Salty conditions

Plant adaptations - Responses to stabiliz factors

① Xerophytes -

Regulators - maintain constant int. env

↓

Homeostasis

|

Endotherms (Regulate body temp)

|

Homeotherms

Osmoregulators

Internal env

const int. env

External env

Organism response to change env.

① Xerophytes Adaptations - (Life cycle and water storage)

① Ephemerals - Annual plants (in 6-8 weeks life cycle complete) in favourable conditions

Drought escapers or Evaders

Unfavourable

↓

Survive as seeds

eg- TRIBULUS
CASSIA

② Succulents

Drought avoiding plants

Perennial plants

|

Store water

↓

Structure (used in unfavourable conditions)

eg OPUNTIA
EUPHORBIA
*ASPARAGUS

• Asparagus has both succulent roots and succulent stem

Photosynthesis

Green Stem

water stored in

- STEM - CHYLOCAULY (Succulent) → PHLLOCLADE/CLADODE
  - Opuntia
  - Euphorbia, Asparagus

- LEAF - CHYLOPHYLLOUS (Succulent) → ALOE, AGAVE, BEGONIA

- ROOT - CHYLORHIZOUS (Succulent) → CEIBA, ASPARAGUS

- SCOTOACTIVE STOMATA (open at night) rare
  ↓
  CAM PATHWAY
  CRASSULACEAN ACID METABOLISM

③

③ Drought enduring / True Xerophytes — Perennial plants — Non-succulents → no H_2O storage

① ROOT - Wall spread / deep roots → reach water table
↓
PHREATOPHYTES
eg Prosopis, Tamarix

② EPIGEAL GROWTH → Shoot system smaller than root system

③ Spines, thorns, prickles → reduce transpiration

④ Epidermis - thick wall, Cuticle thick, multiple epidermis

Stomata sunken → eg NERIUM

☆ Heat shock proteins (CHAPERONINS) are found in plants.

5 Bark formation early & thick

6. Show C4 PATHWAY — KRANZ ANATOMY in leaf (tightly packed cells → less H_2O loss)

7. ★ CHAPERONINS (Heat shock proteins)
↓
Prevent protein denaturation at high temp

Grasses have Bulliform cells called MOTOR CELLS → Water loss → leaf curling → S.A. reduces → less H_2O los.

② Hydrophytes' adaptations

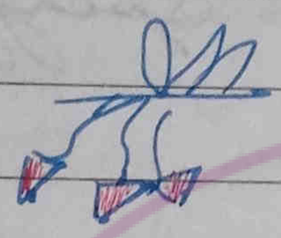
① Submerged — Inside H_2O attached /free
HYDRILLA
VALLISNERIA
CERATOPHYLLUM

② Free floating hydrophytes — Floating on H_2O
PISTIA (water lettuce)
LEMNA
EICHORNIA, WOLFIA (water hyacinth) smallest angios

③ Floating leaf anchored — attached to bottom / floating leaves
NELUMBO (Lotus)
Nymphaea (H_2O lily)
VICTORIA

- **Roots** → poorly developed – Hydrilla
  Absent – Wolffia, Salvinia, Ceratophyllum

  Root hairs/caps → rare/absent
  Instead of root caps have Triangular structures → Root pockets → **BALANCERS**



  eg EICHHORNIA
  LEMNA
  AZOLLA
  PISTIA

  Roots → help in floating → aerenchyma
  eg. JUSSIAEA

- **Stems** – long slender & flexible submerged – HYDRILLA
  – anchored – Rhizome – NYMPHIA
  (Strong stem)

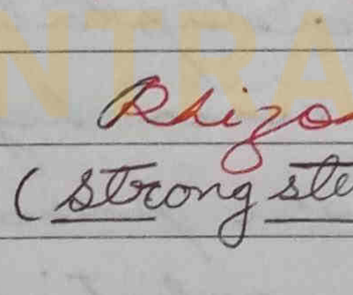
Leaves

stomata (astomatic / no stomata)
- Submerged – ribbon leaf → • VALLISNERIA
  lamina dissected → • CERATOPHYLLUM
- Floating – Broad/Intact

epistomatic (on top only)

Amphibious – Heterophylly

EMERGENT – hydrophytes



eg –
- RANUNCULUS
  LIMNOPHYLLA
  SAGITTARIA

- main two types of leaf on same plant

Turions : Utricularia, Potamogeton

Date
Page

Hydrophytes Anatomy - Hydrophytes

Vascular tissue - Xylem poorly developed

Mech. tissue - Poorly developed / absent Sclerenchyma

Aerenchyma - Abundant (Petiole - Spongy) Eichornia

2° growth - absent
epidermis - single layer
cuticle - absent

Veg. reproduction - very common
Offset - eg Eichornia Pistia
Rhizome - eg Nymphia
Turions (large size buds)

(3) Halophytes adaptations
Salt conc high
Osmotic press high
Water potential is low ↓

① Succulence - in stem, leaf — eg Salsola

② Green stem - — eg - Salicornia

③ Salt excreting glands

④ Thick cuticle

⑤ Multiple epidermis, sunken stomata

☆ Proline and Sorbitol help increase osmotic pressure.

classmate
Date
Page

- **MANGROVE PLANTS** — Halophytes in marshy areas
  - salt water condition
    - water potential decreases
    - uptake of H_2O — difficult

No air in soil → roots are -vely geotropic

↓

① Respiratory roots / Aerophores / Pneumatophores

↓

Have pores

↓

LENTICELS eg — Avicennia / Sonneratia

② PROP-ROOTS — Rhizophora
or
STILT ROOTS present for support.

☆☆

③ VIVIPARY — Germination of seed inside fruit → seedling
(as salty condition not suitable for seed germination)
eg - Rhizophora

④ Plants → have chemicals → *Proline & *Sorbitol → Osmotic Press ↑ Water Pot ↓
accumulation
↓
causes water pot gradient

⑤ Thick cuticle

⑥ Sunken stomata

⑦ Multiple epidermis

Population attributes

(1)

1. **Birth rate** - inc in population by inc in numbers

Lotus Pond - last yr - 20
now + 8 in 1 year

$\frac{8}{20} = 0.4$ Birth rate

0.4 individuals added per lotus per year

2. **Death rate** - dec in population by dec in no.s

Fruit flies - 40
In 1 wk die - 4

$\frac{4}{40} = 0.1$ death

Death rate = 0.1/ind/wk

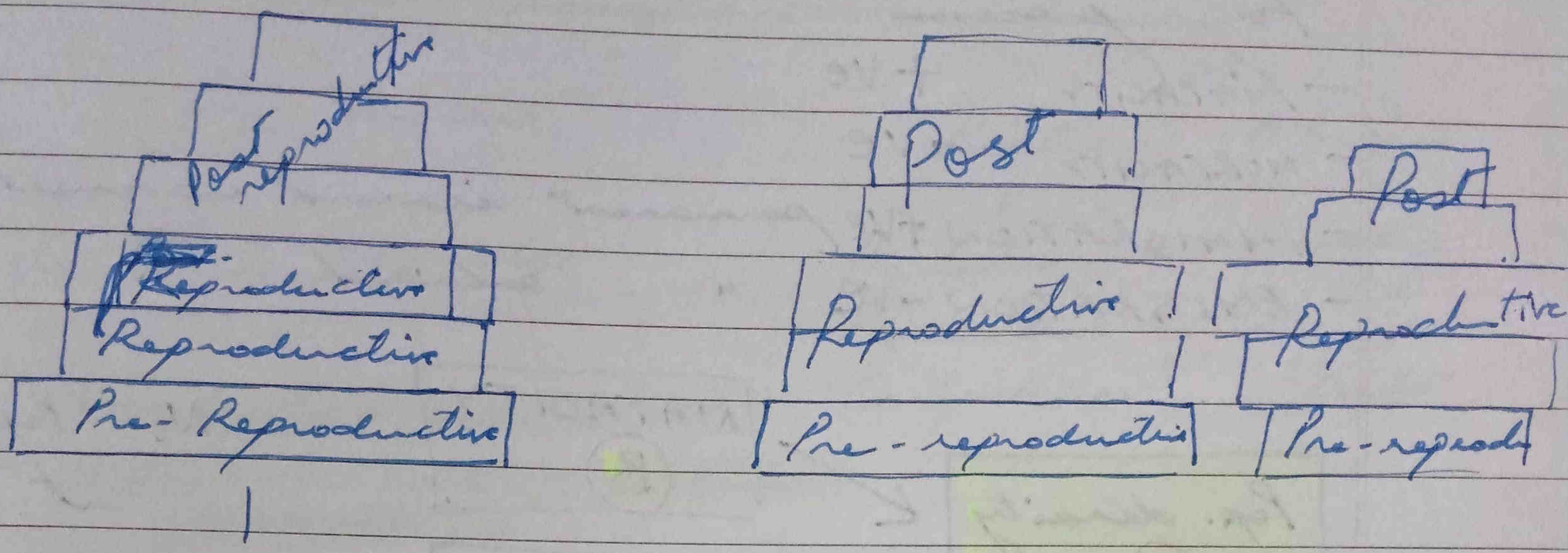
3. **Sex ratio** - Male / Female

(2)

- **Age structure**
  - Pre reproductive
  - Reproductive
  - Post reproductive

Age groups
↓
Age pyramid
↓
Shape of pyramid
/
Growth status

(3) **Age pyramid**



Triangular Shape — Bell shape — Urn Shape

Growing population — Stable — Declining

Post > Pre — Pre = Post — Pre < Post

(4) **Population density** - Individuals / Area

- low < 10 Siberian crane
- million - Chlamydomonas - Pond
- **Biomass** - Living matter / Area - 1 Banyan tree > 200 Pantheonic plants

Relative density and **Absolute density**

↓

used for counting fishes in lakes

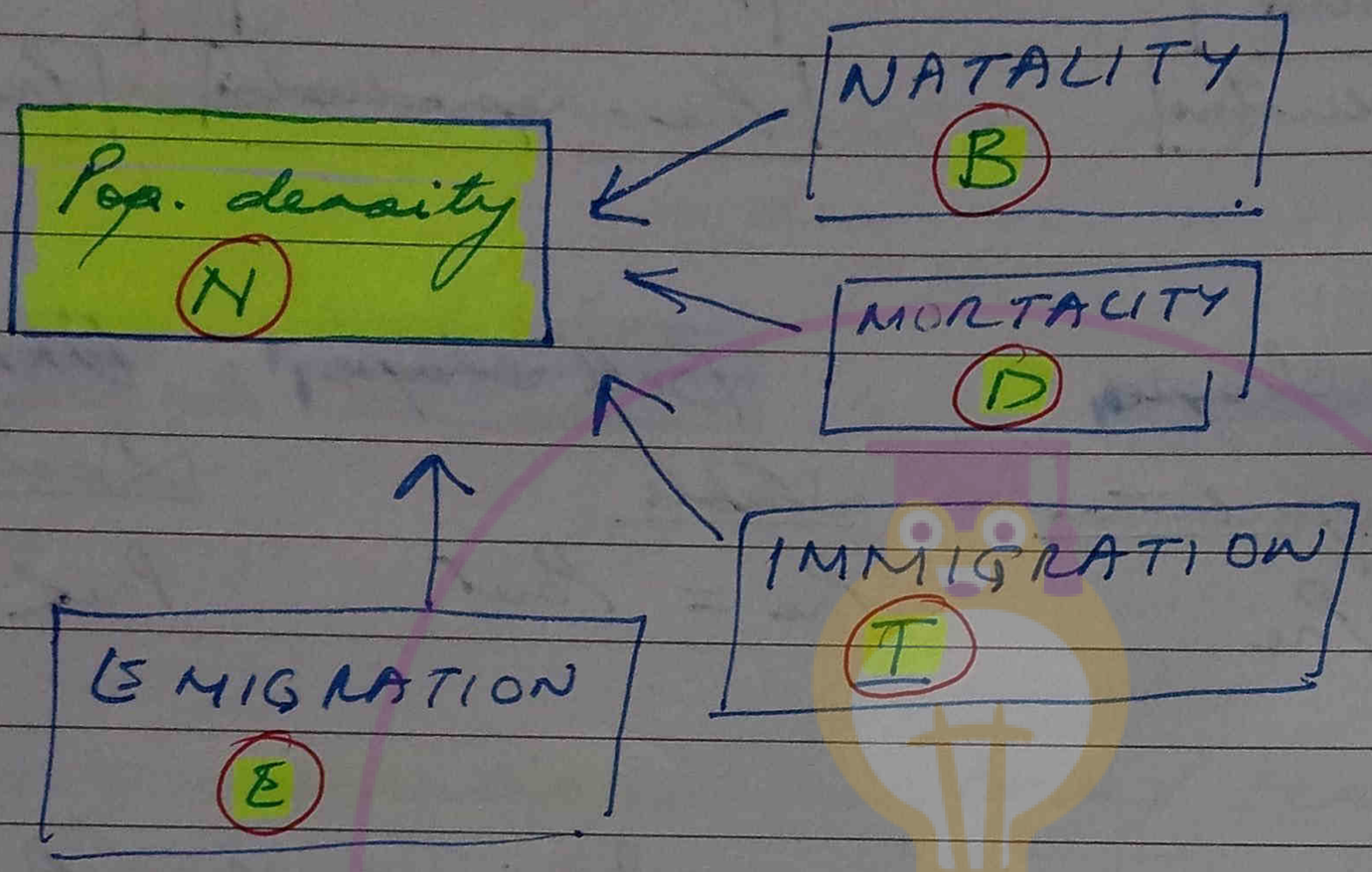
by comparing traps of fishes

- **Indirect counting** - Pug marks (Tiger)
  Faecal pellets

Population Growth

Four process

- NATALITY +ve
- MORTALITY -ve
- IMMIGRATION +ve permanent inward movement in a habi
- EMIGRATION -ve " outward "



N_t = Pop density at time t

N_{t+1} = after time t+1

Pop. density after t+1 = $N_{t+1} = N_t + [(B+I) - (D+E)]$

- Normal Condition B+D
- ★ Special Condition I > B

Colonisation

(K) Carrying capacity - Opt. Resources ⇒ Healthy Individual

K
100

(R) Intrinsic rate of natural increase : Per capita increase in pop. size

Optimum → Max Birth rate & Death rate min

$$R = B - D$$

$\frac{K-N}{K}$

Environmental Resistance

- Env. factor → Check pop size → Check realisation of intrinsic rate of natural increase
- Biotic: Predation, Parasitism, Competition
- Abiotic: Space, H2O, food, light

Exponential Growth.

- Unlimited resources
- All species → (R) intrinsic rate of natural increase

N - Population size $\frac{dN}{dt} = N \times R = RN$

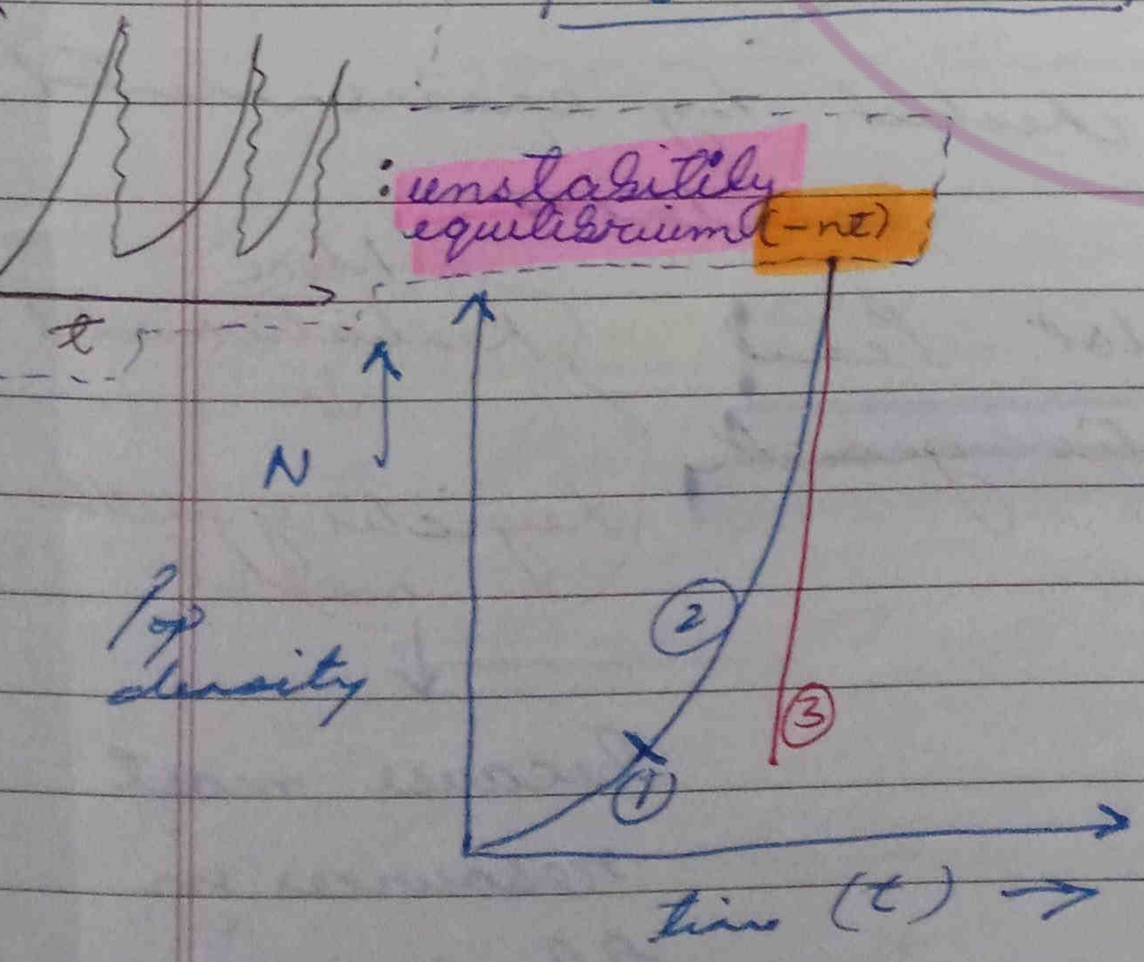
↓ change in pop. size

$N_t = N_0 e^{Rt}$

N_t = Pop. dens. after 't'

N_0 = " " at $t = 0$

e = Base of natural log = 2.71828



① Lag phase - slow

② Exponential phase/Log rapid

③ Crash phase

Shape J

eg - Insects (during fav. season - rainy)

Mosquitoes

Organisms have high Multiplication Rate

OPPORTUNISTIC SPECIES

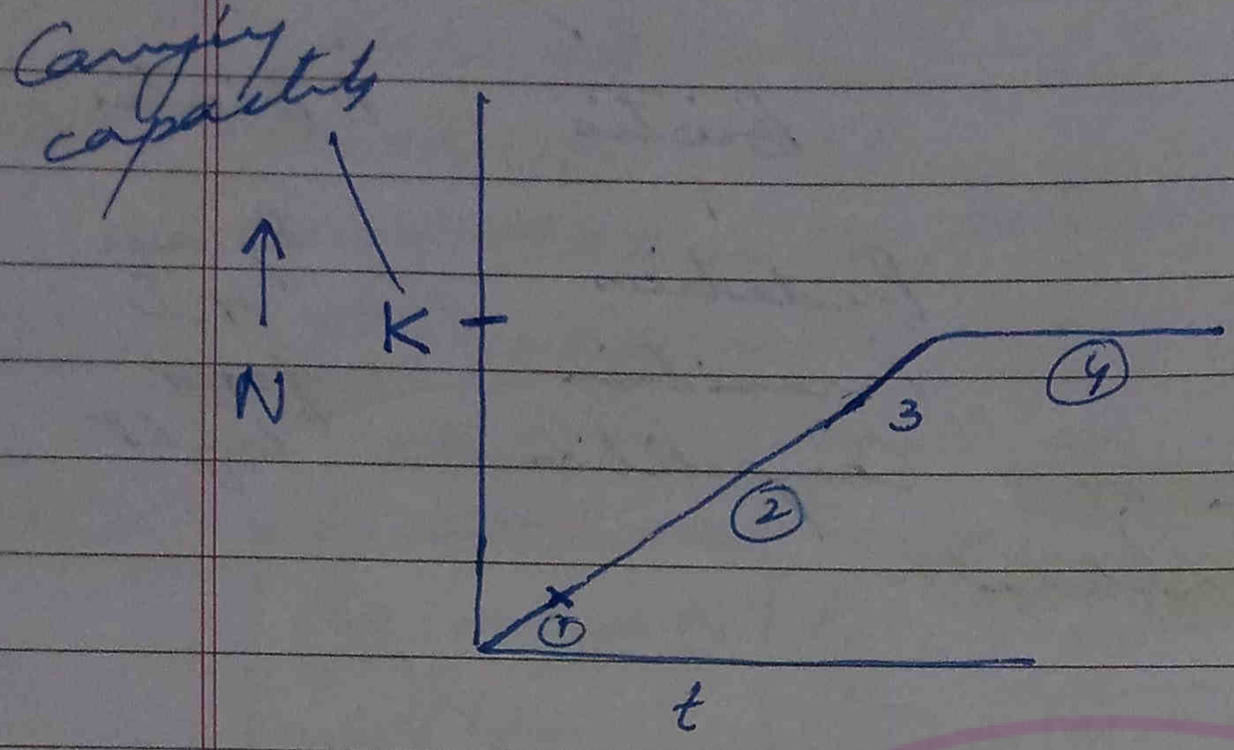
After fav. conditions decline - death - pop. decrease

☆ Equilibrium species can become dominant in an ecosystem because they are more stable.

CLASSMATE
Date
Page

Logistic Growth —

Resources - Limited



① lag phase - slow

② acceleration phase (less than exponential)

③ Deceleration

④ Equilibrium / Asymptote

EQUILIBRIUM SPECIES

S · Sigmoid Curve

low multiplication rate } Trees
high Stability } Humans

★ equilibrium species dominant

$$\frac{dN}{dt} = R \cdot N\left(\frac{K-N}{K}\right)$$

R — intrinsic rate
(K-N)/K — checked by environmental resistance

Growth - Verhulst - Pearl Logistic growth

More Realistic model → Logistic growth model

Because most resources in the environment are limited.

Population Interactions

		Sp. A	Sp. B	
1.	Predation	Benifitted	Harmed	-ve interaction
		+	−	
2	Parasitism	+	−	
3	Competition	−	−	
4.	Amensalism	−	0 (no affect)	
5.	Commensalism	+	0	+ve interaction
6	Protocooperation (non obligatory)	+	+	
7.	Mutualism (Obligatory)	+	+	

① Predation — Role - Energy transfer across trophic levels

Grass → Insects → Frog → Snake

Producers → Herbivores → Carnivores

② Maintaining Species diversity ③ Bio

eg. Pisaster (predator) (american coast)

↓

remove

↓

Prey increases

↓

elimination of prey species (10 invertebrate)

Predator reduces the competition b/w prey species and thus maintains diversity.

classmate
Date
Page

(3) Biological Control :

(1) Opuntia — natural predator - Cactoblastis
↓
85% of insects
feed on plants
* PHYTOPHAGUS

(2) Mosquito larvae - GAMBUSIA (fish)

(3) Red locusts - Myrah (bird)

(4) Aphids - Ladybird (beetle)
(Scale insects)

(5) Red ants - Woodpecker (bird)

Prudent predator - predates sparingly so that pop. size is maintained

Prey - Adaptations for Defence

(1) Camouflage - eg. • Grasshopper; Praying mantis
↓
resemble green leaf
• Dead leaf butterfly; Stick insect
resemble dead leaf

(2) Monarch Butterfly -
toxic chemicals acquired at caterpillar stage
i.e glycoside from plant milkweed.

(3) Plants - Chemicals prevent from herbivores
Opium
Caffeine
Quinine
Strychnine
Cardiac glycoside → Calotropis

shelter, food from Acacia

Acacia — Ants (association)

protected by herbivores

• Parasitism — Parasite - small — Robs host

Host - large

| nutrition, injury
| Weaker
| Shortens life span

Co-evolution between parasite & Host

Adaptations in Parasite

① Resistant eggs + cysts (from digestive enzymes)

② Multiplication rate high

③ Survive in anaerobic conditions

④ Organs - added

Claws - louse

Suckers → leeches

tapeworm

⑤ Organs lost

Whips — louse

Locomotory - plasmodium

Ascaris - digestive glands

Tapeworm - alimentary canal

they absorb already digested food from body wall (swallowers)

To Complete the life cycle one or more intermediate host needed in

Liver fluke → Snail & Fish

Ectoparasite / **Endoparasite**

Exterior / Interior

/

non **not permanent** — non permanent

↓ not dependent on host throughout life cycle

attachment org

partially or total parasite

Total parasite

×

- morphological & anatomical **simple**
- complexity in life cycle

Human lice
Ticks – Dog
Copepods – fishes
Cuscuta – Ledge plants

eg. **Plasmodium (intracellular parasite.)**

↓

total parasite

↓

no chlorophyll
no leaves

Brood Parasite – Nest taken of other birds
Koel uses nest of Crow
to lay eggs
similar colour & size of eggs

* In comparision to endoparasites, ectoparasites are not considered as true parasite because they may be partial parasite.

Competition

Same species
Intraspecific

Different species
Interspecific

Gause Competitive Exclusion Principle

(1) Paramoecium caudatum
Paramoecium aurelia

↓

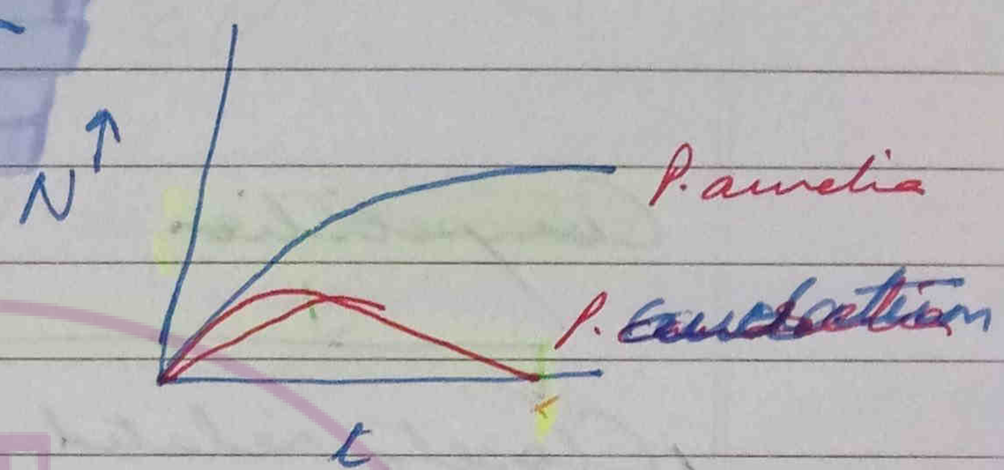
same culture medium

↓

Both have same ecological niche

↓

Superior P. aurelia → eliminate P. caudatum
(Inferior)



(2) Galapagos island - elimination of tortoise due to introduction of goats → grazer more quickly

(3) Barnacles - rocky coast of Scotland

Balanus
larger
Superior

Catharnalus (excluded)
Smaller
Inferior

Coexistence -

Competing species → evolve mechanism →
different feeding times (foraging patterns)
Resource partitioning

Mac Arthur observed - 5 sp. Warblers coexist on same tree
Darwin - 14 sp. finches - coexist on same island
↓
bird

Competition release -

Barnacles → Balanus & Catharnalus (Scotland)
species

Connell removed Balanus (sup. competitor)
Increase of inf. sp. Catharnalus

Competition – Fitness of one species is reduced to the presence of other species

- ✓ Closely related sp or ✓ Unrelated species
- ✓ Limiting resource or ✓ Unlimited resource

Shallow coast of America

Flamingoes (visiting) compete with resident fishes for Zooplankton

Interference Competition

feeding efficiency decreased due to irritating presence of other species

Producers, Herbivores, Carnivores] * Affected adversely by competition.

Amensalism

Release chemicals → Amensal

① Sunflower crops – release chemicals – inhibit weeds
eg Sunflower
Barley, Sorghum

② Trichoderma – inhibit growth of Aspergillus

③ Penicillin – releases antibiotic penicillins. inhibits growth of Bacteria Staphylococ

Allelopathy – Ammensalism shown by plants

Allelochemicals ← secrete

Commensalism

① **Epiphytes** (+) – grow on **Mango** (0)

② **Sucker fish** (Shelter) +ve attached on **Shark** 0

③ **Pilot fish** +ve (feed on leftovers of) → **Shark** 0

④ **Barnacles** +ve (shelter) attached on **Whale** 0

⑤ **Egret** (bird) (food) +ve **Cattle** (0)

Protocooperation + + (Non-obligatory)

① **Ox Pecker** – feeds on – **Rhinoceros**
Leeches, ticks — free from parasites

② **Clover Bird** ↓ eat leaches from mouth of → **Crocodile**

③ **Hermit Crab** — protection from predators
Sea Anemone – transported from one place. Availability of food increases
Sea anemone has chemicals in tentacles

Mutualism ++ Obligatory

① Lichen Algae & Fungi

② Mycorrhiza Fungi + Roots of higher plant

③ Symbiotic N_2 fixation

↓

Rhizobium — Legumes (N_2 fixation)

Frankia — Non-legumes (N_2 fixation)

④ Zoophily & Zoochory — fruits dispersal

Pollination

Angiosperms have to evolve with animals for Pollination and fruit dispersal.

Fig / Ficus — pollinated by Blastophaga Wasp

(Hypanthodium inflorescence)

↓

lays eggs in flower

larvae feed on gall

ORCHID

Ophrys - Petal of flower resembles female insect of COLPA

Pseudocopulation by male causes pollination

same size, colour markings

One to One relation here b/w Orchid & Wasp

Air Pollution

→ 99.95% of air pollutants are natural e.g (pollen) and only 0.05% are anthropogenic

- automobiles are responsible for 80% of all the air pollution and 75% of all the noise pollution.

- Tobacco smoke contains a radioactive compound polonium 210 which is carcinogenic.

SOx

- Photosynthetic activity decrease

Mg removed from chlorophyll

e.g Rea, lichen highly sensitive

- Acid rain ✓ 65%
  pH < 5

NOx

↓

ETS affected ✓ 30%

Taj mahal stone leprosy
$CaCO_3 \longrightarrow CaSO_4$ 5% HCl

Sox	Nox
Classical smog	Photochemical smog
1952	1946
- London smog	Los angeles
1° pollutants	2° pollutants
SO_x, H_2S	O_3 + PAN
low temp	warm
reducing	oxidising

* Among all hydrocarbons, methane is maximally responsible for air pollution.

* Formaldehyde - Indoor pollution - released from newly formed carpets.

- Increased photosynthesis in green plant due to increased CO_2 in atmosphere = CO_2 fertilisation effect.

- Ozone works as a greenhouse gas in troposphere and is not required hence called chemical weed.

- Rowland, Crutzen, Molina gave the reactions of ozone depletion.