Organisms and Populations Class 12 Key Points

CBSE Class 12 Biology · NCERT · for boards, NEET and JEE revision

ChapterNotes

Ecology & Its Levels

Organism → Population → Community → Biomes

Direction is smallest → largest; a scrambled order is a common trap.

- Order goes organism → population → community → biome
- Studied from a single individual up to whole climatic regions
- Interactions are both with living and non-living surroundings

Abiotic Factors

eury- = WIDE tolerance · steno- = NARROW tolerance

Eurythermal/stenothermal (temperature); euryhaline/stenohaline (salinity).

- Major factors: temperature, water, light, soil
- Temperature affects enzyme kinetics → controls metabolism & distribution
- For aquatic life, salinity is the key water variable

Responses to Stress

Regulate · Conform · Migrate · Suspend

~99% of animals and nearly all plants are conformers (cheapest strategy).

- Regulate = hold internal state constant (all birds & mammals); costly
- Suspend = dormancy: spores, hibernation (winter), aestivation (summer), diapause
- Migrate = leave temporarily (Siberian cranes → Keoladeo)

Adaptations

Allen's rule: colder climate → SHORTER ears/limbs (less heat loss)

Kangaroo rat makes water by fat oxidation + concentrated urine, no drinking.

- Desert plants: thick cuticle, sunken stomata, CAM photosynthesis
- Opuntia has spines (not leaves) + flattened photosynthetic stem
- High-altitude humans make more RBCs to offset low oxygen

Population Attributes

Density (N) = count ÷ area · plus natality, mortality, sex ratio

Density may be % cover or biomass (e.g. Lantana), not always a head count.

- Natality = birth rate added; mortality = death rate removed
- Tigers counted indirectly via pug marks & faecal pellets
- A single birth/death is an event, not a population attribute

Age Pyramids

Broad base → expanding · Bell → stable · Narrow base → declining

Read the BASE first: young at the base mean future growth.

- Triangular/expanding = large pre-reproductive cohort
- Bell-shaped/stable = births balance older groups
- Urn-shaped/declining = few young replacing the old

Exponential Growth

$dN/dt = rN \rightarrow N_t = N_0\, e^{rt}$

r = b − d (intrinsic rate); e^0.693 ≈ 2, so 0.693/r = doubling time.

- J-shaped curve, shoots up without limit (unrealistic long-term)
- $N_t = N_0\, e^{rt}$ gives size after time t
- If births = deaths then r = 0 and size stays steady

Logistic Growth

$dN/dt = rN \cdot (K - N)/K$

Verhulst–Pearl model; sigmoid: lag → acceleration → deceleration → plateau at K.

- When N = K → growth = 0 (population is largest)
- Growth RATE is maximum at N = K/2
- More realistic than exponential; carrying capacity exists only here

Life History & r

Semelparous (breed once, then die) vs Iteroparous (breed many times)

Bamboo & Pacific salmon = semelparous; most birds/mammals = iteroparous.

- Unpredictable habitats favour many small offspring
- Stable habitats favour fewer, larger offspring
- r values: Norway rat ≈ 0.015, flour beetle ≈ 0.12, human(US 1981) ≈ 0.0205

Population Interactions

++ Mutualism · −− Competition · +− Predation/Parasitism · +0 Commensalism · −0 Amensalism

Predation usually kills prey; parasitism keeps the host alive & is host-specific.

- Mutualism: lichen, mycorrhiza, fig–wasp, Ophrys pseudocopulation
- Gause's exclusion: same limited resource → cannot coexist; resource partitioning dodges it
- Cuscuta = parasite; barnacle-on-whale & orchid-on-tree = commensalism

Quick revision

- Regulators (maintain constancy) vs Conformers (change with environment)
- Hibernation (winter sleep), Aestivation (summer sleep), Diapause (insects, suspended development)
- Exponential growth: J-shaped, dN/dt = rN; Logistic: S-shaped, dN/dt = rN(K-N)/K
- K = carrying capacity; at K, growth = 0
- Mutualism (+/+), Predation (+/–), Parasitism (+/–), Competition (–/–), Commensalism (+/0)
- Gause's principle: competitive exclusion

Full chapter notes with solved examples and practice questions: https://chapternotes.in/cbse/class-12-biology/organisms-and-populations-class-12-notes/