Module 4 – Bullet Point notes

Quadrats

- Large Sample;
- randomly placed (random number generator);
- Estimate percentage of area

Line Transects

Problems:

- transect line may not go through representative areas /may avoid certain areas;

Require:

- large sample;
- how random coordinates are generated / how random places chosen;

Carbon Cycle

- carbon dioxide taken in as a result of photosynthesis / more photosynthesis than respiration;
- idea that carbon is fixed/incorporated into compounds in the trees;

Role of Microbes/Fungi

- extracellular digestion;
- by secretion of enzymes;
- hydrolysis/breakdown/digestion of carbon compounds;
- respiration (by bacteria);
- releasing carbon dioxide;
- taken up by the plant during photosynthesis;

Nitrogen Cycle

- Organic compounds of nitrogen / named example;
- converted to ammonium compounds / ammonia;
- by saprophytes / saprobionts / decomposers / equivalent;
- to nitrites;
- to nitrates;
- by nitrifying bacteria / named bacteria;
- uptake by roots;

Nitrogen Fixation

- Nitrogen fixing bacteria / named e.g.;
- in root nodules (of legumes);
- convert nitrogen to ammonium / organic compounds (in legume);
- released on decomposition;
- and converted to nitrates; less need for fertiliser;

Nitrification

- (Ammonium) □ nitrite;
- Nitrite □ nitrate;

OR

- Ammonium □ nitrate; (*1 mark only*)

If symbols: correct symbols
e.g. ammonium (*nitrate* (*NO_3*) *= NO MARKS*

- By nitrifying bacteria / *Nitrosomonas* / *Nitrobacter* / nitrification;
- By oxidation / using oxygen / aerobic;

Denitrification

- conversion of ammonium or ammonia into nitrite/ammonium or ammonia into nitrate/nitrite to nitrate

Detritivores V Decomposers

- Decomposers secrete enzymes / onto organic matter/ food/ extracellular breakdown;
- Detritivores ingest / eat/ take in organic matter/food first;

Energy Flow in Ecosystem (Loss of energy)

- some light reflected/ not absorbed/refracted (if qualified) back into atmosphere;
- some light misses chloroplasts/chlorophyll;
- only certain wavelengths of light used (in photosynthesis);
- only a proportion of heather eaten/not all plants eaten/energy lost in decay;
- not all food eaten is digested/energy lost in faeces;
- heat/energy lost due to respiration;

Why less than 5 trophic levels

- only a proportion of organism eaten/not all eaten/energy lost in decay;
- not all food eaten is digested/energy lost in faeces;
- heat/energy lost due to respiration;

Succession

- change in habitat/environmental conditions by the species present;
- making it less suitable for existing species/more suitable for other species;
- reference to competition;
- lichens able to survive hostile environment /colonised by short-lived plants / short lived plants are pioneers;
- short-lived plants fast growing/spreading/distribute seeds quickly;
- (death of lichens/ growth of) lichens/other named plant makes the habitat less hostile / short-lived plants change the environment e.g. make conditions more favourable for long-lived plants;
- example of reduce hostility; (trap soil particles/ absorb water/ add humus)
- other plants move into the changed environment / new species colonise once there is a change;
- increase in number of species/diversity;
- increase in total amount of living material/biomass/ more niches;
- increase in nutrient availability;
- change from more extreme conditions / more stability;

Climax Community

- stable community/no further succession/final community;

Factors Limiting the size of the Climax Community

1. named nutrient availability;
2. numbers of <u>producers</u> providing <u>energy</u> (for a food chain);
3. <u>light</u> intensity affecting the rate of <u>photosynthesis</u>;
4. <u>disease</u> <u>killing</u> (weaker) members of species;
5. space for nest building / niches;
6. reproductive rate balancing death rate;
7. competition for a named limited resource;
8. (intra and interspecific) competition explained;
9. predation described;

Farming Effects on Succession

- e.g. crops are planted (not native plants);
- these compete with native plants;
- ploughing returns to bare soil;
- destroys herbaceous plants/tree/shrub seedlings;
- grazing by farm animals;
- destroys herbaceous/shrub seedlings/communities.

Biological Control

- laboratory conditions to study possible effect on native species;
- as may compete with other species for habitat/food;
- may parasitise other species/be preyed on by other species;
- large numbers increases chance of successful introduction;
- decline in pest indicates control is taking place/control is successful;
- numbers of pest must be reduced so that amount of damage is economically acceptable;
- stable coexistence means no need for further introduction of parasite/no additional measures are required;
- pest needs to be kept at low levels to prevent damage to crop;
- if pest dies out parasite may become a pest itself/if parasite dies out it will have to be reintroduced;

Advantage of Biological Control over Chemical control

- does not need repeated treatment;
- maintains low level of pest/ not allowing pest numbers to rise(above economic threshold);

Integrated Pest Control

- chemical controls initial surges in pest numbers / less chemicals used;
- biological gives longer term control of pests;

Human Populations

Reduction in Death Rate

- better nutrition
- better knowledge of spread of disease
- better post-natal care (mother or child);
- reduction in infectious diseases
- application of medical advances
- clean water
- improved living conditions (specific e.g. sanitation)
- use of vaccinations (1.herd immunity/effect; 2.any individual has lower chance of meeting infected individual; 3.lower chance of disease being passed on/prevents spread of disease;)

Increase in Birth rate

- lack of contraception
- large families needed to help family provide sufficient food/earn income

- pressure to have many children due to high infant mortality rate
- cultural/religious idea of extended family;
- more people survive to reproductive age;
- better pre-natal care / health care of mother;
- better nutrition of mother;

Photosynthesis

- light energy is used in the synthesis of organic molecules.

Light-dependent reaction

- light energy excites electrons in chlorophyll (during photolysis);
- the energy from these excited electrons is used to generate ATP and reduced NADP;
- photolysis of water makes hydrogen available for the light independent reaction and gaseous oxygen is released

Light-independent reaction

- RuBP combines with carbon dioxide to produce 2 x glycerate 3-phosphate;
- ATP and reduced NADP are required for the reduction of glycerate 3-phosphate to carbohydrate;
- ribulose bisphosphate is regenerated.
- Glucose formed - used in respiration / formation of starch / cellulose

Chloroplast
Granum/thylakoid;
chlorophyll molecules to trap light / light absorbing pigments/ light dependent reaction / part of light dependent reaction;
stroma;
(contains enzymes for) carbon dioxide fixation/light-independent reaction/ part of light-independent reaction;

Photosynthetic Inefficiency

- some light reflected/ not absorbed/refracted (if qualified) back into atmosphere;
- some light misses chloroplasts/chlorophyll;
- only certain wavelengths of light used (in photosynthesis);

Respiration

- energy in organic molecules is made available for other processes within an organism.

Aerobic
Glycolysis

- oxidation of glucose to pyruvate with a net gain of ATP and reduced NAD;

Link Reaction

- pyruvate combines with coenzyme A to produce acetylcoenzyme A;

Krebs cycle

- acetylcoenzyme A (2C) combines with 4C molecule to produce 6C molecule which enters Krebs cycle;
- involves a series of oxidation reactions
- release of carbon dioxide
- production of ATP and reduced coenzyme (NAD or FAD);

Electron transport chain

- electrons/hydrogen combine with NAD or FAD/ NADH or FADH;
- electrons passed through series of carriers;
- H+ / protons passed into intermembrane space;
- H+ / protons flow back through stalked particles/enzyme;
- energy released in transfer;
- energy used to make ATP;
- from ADP and inorganic phosphate/ using ATPase;

ATP

- synthesised from ADP and inorganic phosphate
- immediate source of energy for biological processes.
- Releases energy on breakdown/hydrolysis;
- Uses energy from other reactions to form;
- Can be readily moved/stored/broken down when needed;
- Allows energy to be released in suitable amounts;

Mitochondria

Cristae

- larger surface area for electron carrier system / oxidative phosphorylation;
- provide ATP / energy for contraction;

Matrix

- site of kreb's cycle

Genotype

- genetic constitution of an organism.

Phenotype

- expression of this genetic constitution and its interaction with the environment

Allele

- different form of a gene (different DNA sequence)

Recessive

- only expressed (in the phenotype) when homozygous

Sex-linked

- sex-linked gene is on the X chromosome (in humans)/ Y chromosome.

Codominant alleles

- both expressed (in phenotype), if both present,

Dominant Allele

- all individuals with allele develop / aware of disease;
- therefore might choose not to have children;

OR

- carriers may be unaware that they have allele/are unaffected;
- and therefore have children

Sex determination

- X and Y chromosomes are different sizes / shapes;
- chromatids unable to line up and form bivalent / only short pairing region / most of length not homologous;

Crosses involving sex-linked characteristics

- males are XY and females XX / males have one X chromosome and females two X chromosomes;
- males only have one allele (of the gene) present / recessive allele always expressed;
- condition is masked in heterozygote / female needs 2 recessive alleles to be sufferer;

Variation

continuous

- due to environmental factors and/or polygenic (more than one gene)
- range between extremes/no discrete types;
- strong environmental influence;
- polygenic/many genes involved;
- quantitative.

discontinuous

- due to genetic factors (either/or).
  - discrete types; little/no environmental influence/only genetic;
  - (often alleles of) 1/2 gene;
  - qualitative.

Causes of variation

- differences in environmental factors
- result of genetic factors
- combination of both

Hardy-Weinberg – assumptions

- No selection;
- random mating/no sexual selection;

- large population/gene pool;
- no emigration/immigration/no migration/isolated population;
- no mutation;
- equally viable gametes/all equally fertile;
- generations do not overlap;

Random fusion of gametes / fertilisation;
- new combination of alleles;

Mutation
- different/new allele formed / genes deleted or duplicated/ sequence of genes changed
- contribute to genetic variation.

Natural selection
- variation present in (original population);
- best adapted individuals more likely to survive;
- (these reproduce and) pass on genes (to next generation/offspring);
- more/increase (in frequency) of these alleles/genes;
- Individuals within a species may show a wide range of variation.
- Predation, disease and competition result in differential survival and reproduction.

Speciation – (Geographic Isolation)
- isolation of two populations; barrier (sea, land, mountain)
- variation already present due to mutations;
- different environmental conditions / selection pressures;
- selection of different features and hence different alleles;
- populations become (genetically) different;
- different frequency of alleles;
- separate gene pools / no interbreeding; breed together;
- if fertile offspring, then same species; infertile offspring, then different species

Reproductive Isolation
- selection of mate dependent on colour pattern;
- prevents interbreeding / keeps gene pools separate;

Speciation - Sympatric
- Common ancestor varied;
- Due to mutation;
- Differences in local environment/food supply;
- Better adapted varieties survived and reproduced;
- Passing on genes for these characteristics;
- Habitat/behavioural isolation;

Directional Selection

- Variation is genetic;
- Selection for / against <u>one extreme</u> (*general point not related todata*
- Only certain organisms will (survive and) breed / pass on genes;
- Leads to a change in that characteristic (tending towards one extreme);

Stabilising Selection

- Occurs in an unchanging environment;
- (Initial range of values in which) mean is best adapted;
- Selection against extremes / selection for the mean;
- Mean/median/mode unaltered
- Range/S.D is reduced;
- Repeated over many generations;
- Increasing proportion of populations becomes well adapted to environment;

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