



## Chapter 14

### Ecosystem

1. What is detritus?

Ans. Dead organic matter or remains of plant such as leaves, bark, flower and dead remain of animals, including faecal matter constitute detritus.

2. What is net primary productivity?

Ans. The amount of energy or biomass remaining in a producer after meeting the cost of its respiration and is passed on to next trophic level is called the net primary productivity.

3. Why is the rate of assimilation of energy at the herbivore level called secondary productivity?

Ans. It is because the biomass available to the consumer for consumption is a resultant of the primary productivity from plants.

4. All the primary productivity is not available to a herbivore. Give one reason.

Ans. All the primary productivity is not available to a herbivore because a considerable amount is utilised by the plant by respiration.

5. Write the equation that helps in deriving the net primary productivity of an ecosystem.

Ans.  $GPP - R = NPP$

6. Write a difference between net primary productivity and gross productivity.

Ans. Gross productivity (GPP) is the rate of production of organic matter during photosynthesis. Net primary productivity (NPP) is the available biomass for the consumption by heterotrophs.  $GPP - R = NPP$

7. What is secondary productivity?

Ans. Secondary productivity is defined as the rate of formation of new organic matter by consumers.

8. State what does 'standing crop' of a trophic level represent

Ans. Standing crop represents the mass of living material (biomass) at a particular time.

9. List any two ways of measuring the standing crop of a trophic level.

Ans. Standing crop is measured as the biomass or the number of plant in a unit area.

10. Differentiate between standing state and standing crop in an ecosystem.

Ans. In an ecosystem, standing crop is the mass of living material in each trophic level at a particular time. Whereas standing state refers to the amount of nutrients in the soil at any given time.

11. What is a detritus food chain made up of? How do they meet their energy and nutritional requirements?

Ans. Dead plant and animal remains and their faecal matter constitute Detritus. DFC includes decomposers which obtain energy by decomposing the dead materials.

12. "Man can be a primary as well as a secondary consumer." Justify this statement.

Ans. Man has a varied diet. When on vegetarian diet, they are primary consumers and when on nonvegetarian diet, they are secondary consumers.

13. How are productivity, gross productivity, net primary productivity and secondary productivity interrelated?

Ans. Productivity is the rate of biomass production. GPP is rate of production of organic matter during photosynthesis.  $GPP - R = NPP = 1$  Where NPP is biomass available to consumers for secondary productivity. Secondary productivity is rate of formation of new organic matter by consumers

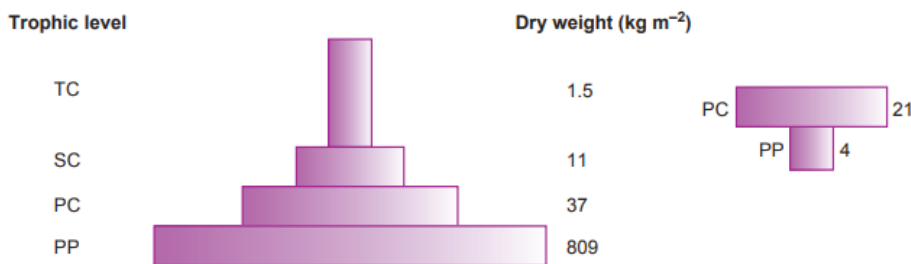
14. "It is possible that a species may occupy more than one trophic level in the same ecosystem at the same time." Explain with the help of one example.

Ans. For example, sparrow is an omnivore. When it eats seeds, fruits or any other plant products, it occupies the primary trophic level. Whereas, when it eats worms and any other insect, it occupies the secondary trophic level. Thus, it occupies more than one trophic level in the same ecosystem.

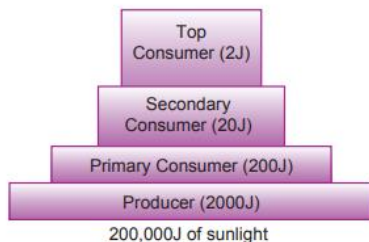
15. Justify the importance of decomposers in an ecosystem.

Ans. Decomposers which are heterotrophic organisms, mainly fungi and bacteria, break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients. They meet their energy and nutrient requirements by degrading dead organic matter or detritus. These are also known as saprotrophs. Decomposers secrete digestive enzymes that breakdown dead and waste materials into simple, inorganic materials, which are subsequently absorbed by them.

16. Compare the two ecological pyramids of biomass given below and explain the situations in which this is possible. Also, construct an ideal pyramid of energy, if 200,000 joules of sunlight is available.



Ans. The first pyramid of biomass corresponds to a terrestrial ecosystem. Second pyramid refers to a small standing crop of phytoplankton supporting a large standing crop of zooplankton or an aquatic ecosystem.



17. "In a food-chain, a trophic level represents a functional level, not a species." Explain.

Ans. A given species may occupy more than one trophic level in the same ecosystem (in different food chains) at the given time. If the function of the mode of nutrition of species changes, its position shall change in the trophic levels. The same species can be at primary consumer level in one food chain and at secondary consumer level in another food chain in the same ecosystem at the given time.

18. Explain with the help of two examples, how the pyramid of number and the pyramid of biomass can look inverted.

Ans. The pyramid of biomass in sea is generally inverted because the biomass of fishes far exceeds that of phytoplankton and the number of big fishes eating the small fishes is also greater than the small ones. Also in pyramid of number, the number of insects feeding on a big tree is far greater than the number of trees. Now the number of small birds depending on the insects and the number of larger birds eating the smaller ones also increases in the order.

19. (a) Name the type of detritus that decomposes faster. List any two factors that enhance the rate of decomposition. (b) Write the different steps taken in humification and mineralisation during the process of decomposition.

Ans. (a) Detritus rich in nitrogen decomposes faster. These are water-soluble substances like sugar. Factors enhancing rate of decomposition: Warm temperature, moist environment, availability of oxygen. (b) Humification: Accumulation of dark coloured amorphous substance called humus which is resistant to microbial action and undergoes decomposition at a very slow rate. Mineralisation: Humus is further degraded by microbes releasing inorganic nutrients.

20. Describe the process of decomposition of detritus under the following heads: Fragmentation; leaching; catabolism; humification and mineralisation.

Ans. The process of breaking down complex organic matter into inorganic substances like—, water and nutrients is called decomposition. The raw material for decomposition is called detritus. They are dead remains of plants and animals. Steps in decomposition: (a) Fragmentation: The process of breaking down of detritus into smaller particles is called fragmentation, e.g., as done by earthworm. (b) Leaching: The process by which water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. (c) Catabolism: The enzymatic process by which degraded detritus is converted into simple inorganic substances is called catabolism. (d) Humification: The process of accumulation of a dark coloured amorphous substance called humus, that is, highly resistant to microbial action and undergoes decomposition at an extremely slow rate. (e) Mineralisation: The process by which humus is further degraded by some microbes and release inorganic nutrients is called mineralisation.

21. (a) What is a trophic level in an ecosystem? What is 'standing crop' with reference to it? (b) Explain the role of the 'first trophic level' in an ecosystem. (c) How is the detritus food chain connected with the grazing food chain in a natural ecosystem?

Ans. (a) The specific places occupied by an organism in the food chain is called trophic level. Each trophic level has a certain mass of living material at a particular time which is called as the standing crop. (b) The first trophic level is comprised by the producers which trap solar energy to convert it into chemical bond energy of food. They serve as food for subsequent trophic levels. (c) The organisms of the detritus food chain (DFC) are the prey to the grazing food chain (GFC) organisms. The dead remains of GFC are decomposed into simple inorganic materials. These materials are then absorbed by DFC organisms.

22. What will happen to an ecosystem if (a) All producers are removed; (b) All organisms of herbivore level are eliminated; and (c) All top carnivore population is removed.

Ans. (a) Reduction in primary productivity. No biomass available for consumption by higher trophic levels/heterotrophs and hence heterotrophs also die of starvation. (b) Increase in primary productivity and biomass of producers. Carnivore population will subsequently dwindle due to food shortage. (c) Increase in number of herbivores which leads to over-grazing by herbivores, finally resulting in desertification.

23. Citing lake as an example of a simple aquatic ecosystem, interpret how various functions of this ecosystem are carried out. Make a food chain that is functional in this ecosystem.

Ans. (i) Productivity: Conversion of inorganic into organic material with the help of solar energy by the autotrophs. (ii) Energy flow: Unidirectional movement of energy towards higher trophic level (and its dissipation and loss as heat to the environment). (iii) Decomposition: Fragmentation, leaching, catabolism, humification, mineralization by bacteria, fungi and flagellates (abundant at the bottom of lake). (iv) Nutrient cycling: Decomposition of dead matter to release the nutrients back to be re-used by the autotrophs. Food chain in aquatic ecosystem (lake): Phytoplanktons → Zooplanktons → Small fish → Big fish

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