PERSONAL INFORMATION

ECOLOGICAL AND ENVIRONMENTAL HAZARDS

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Abstract: Ecology and Environmental biology is the branch of science concerned with plant and animal relationship and their interaction with the environment. Ecology is a multidisciplinary science which includes not only the life science, but also chemistry physics, geology, geography, metrology, climatology, hydrology, anthropology, archeology, sociology and even mathematics and statistics as well. The behaviour of an organism or biotic community in a given enviornment can be explained by making use of data obtained from a number of sources such as morphology, taxonomy, genetics, soil Science, Physiology, Geology etc. Many practical applications of ecology are found in agriculture, horticulture, forestry, limnology, fishery, pest control, public health, toxicology, pollution control etc. A knowledge of ecological principles helps in discovering new sources of food, unpolluting sources of energy (e.g. solar energy) and new methods of pest control. By making use of ecological principles the deserts can be converted into agricultural lands.

Keywords: Ecology, Environment, Temperature, Wind, Light

Environment and Eco Factors

Environment includes all the external factors such as soil, water, air, light, temperature, humidity etc., which gave a direct influence on the activities of the organism. Closely related to the environment is habitat which means the particular place where organism grow and live. Each part of the environment is called the ecological factor or environmental factor. Ecological factors are of two types i.e., biotic or non-living, and biotic or living factors.

Abiotic Factors.

The main abiotic factors are climatic factors (temperature, light, rain fall etc), medium factors (soil, water, air), physical factors (fire, pressure, geomanetism) and chemical factors (acidity, alkalinity and availability of nutrients needed by plants.

Temperature. The heat effects are caused by solar energy falling on the surface of the earth. In space, heat travels in the form of radiation. Some sources other than sun also produce heat which affect atmosphere. The temperature affects wind velocity, evaporation and rainfall, sea currents, soil formation from rocks and other vital activities. All forms of life are affected by the environmental temperature where they live. The temperature is a variable factor and is influenced by time, slope, latitude, direction and industrialization. Life processes are all controlled by the temperature.

The COLD BLOODED or POIKILOTHERMIC ANIMALS in which body temperature with the variation in the environmental temperature, are worst affected by the temperature than the WARM BLOODED or HOMEOTHERMIC ANIMALS, in which body temperature remains almost constant, The cold blooded animals, therefore, undergo hibernation or winter sleep during the cold period of the year and aestivation or summer sleep during the hotter period of the year. Warm blooded animals are not-much affected directly by change in environmental temperature. The body activities of these animals, may however, be influenced by the fluctuation of temperature. In fact, every living organism has a range of tolerance temperature. The life activities of the organisms occur best at the optimum temperature (0^0C to 50^0C). The body activities of the organisms cease at the limiting temperature, i.e., the temperature beyond the minimum and maximum limit. Since temperature is highly variable in time and space, the countries near equator are warmer than those which are on north and south poles.

Temperature affects the morphology, physiology, biochemistry and distribution of the plants. The rate of transpiration is directly proportional to temperature. Optimum temperature is required for germination, growth, flowering and fruiting etc.

Light. Sun is the most important source of energy on our planet. The solar energy that sustains all life on the earth is received in the form of electromagnetic waves. Light affects and regulates the plant activities in a variety of ways and is responsible for the growth and photochemical activities of the plants like photosynthesis, transpiration, movement, germination and reproduction. The quality of light (its wave length), its quantity (intensity) and duration (photo period) influence the activities of plants.

Solar energy is received unequally by the earth surface. It is due to the fact that energy flux depends on seasons, time of the day, dirt and atmospheric humidity. Besides many of the environmental phenomenon like wind movement, currents, rainfall, air, shape of earth, distance between sun and earth, direction of slope of mountains are also influenced

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by the quantity of solar energy reaching the earth. It decreases from equator to poleis.

Humidity. The presence of water vapours in air is known as atmospheric humidity. Absolute humidity is the maximum amount of moisture that the atmosphere can hold at a fixed temperature and pressure. The ratio of real humidity and humidity which could be held in the air at that temperature is called the relative humidity (RH). Relative humidity at a given place is influenced by moisture, temperature. pressure (altitude), air velocity, vegetation and soil water. Humidity plays an important role in regulating the activities of the organisms.

Wind Velocity. The effect of wind is less marked in animals than in plants. The transpiration of plants is directly influenced by wind velocity. The latter helps in the distribution of generally small animals from one place to another. For example, cysts, eggs and even small animals like winged insects are often carried away by wind from one place to another. It is also helpful in the dispersal of pollen grains, seeds and fruits. Wind in the form of storms influences much both the fauna and flora of a particular locality.

Atmospheric Gases. The cover of air that envelopes the earth is called the atmosphere. The atmosphere constituters a mixture of gases, the composition and ratios of which very somewhat with height. The atmosphere contains $O_2\,(21\%), N_2\,(78\%), CO_2\,(0.3\%)$ and water vapours (0.1%).

Traces of other gases such as argon, helium, ammonia, sulphur dioxide, sulphur troxide, ozone and methane are also present in the air, along with dust particles, smoke, micro-organisms, pollen grains etc. Oxygen is used in respiration by all organisms. The photosynthesis of green plants gives out oxygen in the atmosphere in the day light. The oxygen is released through stomata,

$$6CO_2 + 12H_2O \xrightarrow[Chlorophyll]{h\nu} C_6H_{12}O_6 + 60_2 + 6H_20$$

The oxygen is consumed by terrestrial and aquatic animals for energy production and they release CO_2 which is used by the plants in photosynthesis. This cycle of oxygen occurs in nature. A small amount of atmospheric oxygen is converted into ozone by photochemical reactions. This ozone layer covers the gaseous envelope around the earth and prevents from the harmful effects of ultra violet rays.

The bulk of the atmosphere is made up of nitrogen, which dilutes the oxygen and slows down the process of oxidation. Nitrogen is the primary source of nutrients for plants and other biological systems. Nitrogen is an essential constituent of chlorophyll and is also a part of DNA and RNA in living beings.

Rainfall. The hot air masses moving from sea, oceans, lakes and ponds are extremely moist. While moving up to elevations or cooler plances, this condensation of atmospheric moisture is the ultimate source of water for the plants. The type and density of vegetation depends upon the quantity of rainfall which also depends upon the weather and geographic regions like altitude, seasonal air, direction of mountains and distance from the sea.

Medium Factors

There are four types of media in which organisms live. These are soil, water, air and the bodies of other organisms in case of parasites.

Biotic factors

The living or biotic environment generally deals with direct and indirect effects of organisms on individuals. This is probably due to the fact that processes like growth, nutrition and reproduction depend upon interactions of other members within the species or between the members of heterogeneous groups.

Interaction among the individuals of same species is known a intra specific interaction, while that among the individuals of different species is called inter specific interaction. These interactions may be harmful as well as beneficial to the participants. Interspecific interactions include neutralism, competition, mutualism, predation, etc.

In neutralism neither of the population (a population is a group of interactiong individuals, usually of the same species, in a definable space) directly affects the other. In competition two species may have a negative effect on one another. It occurs between two or more organisms for a limited amount of food, water, shelter or other resources. Competition may be between the individuals of the same species (intraspecific competition) or between the individuals of different species (interspecific competition). Mutualism refer to the interaction that is strongly beneficial to both species. In predation one animal kills another animal or plant for food. The species that capture, kills and eats up is called predator or enemy and that which is held is called the prey. The predator cannot survive without the prey.

Intraspecific interactions include cannibalism, colonization, aggregation, social organisation etc. Cannibalism is an interaction in which larger members of a species eat up the smaller member of the same species. Colonization is the grouping of free living protozoan's to form colonies. Aggregation refers to the tendency among animals to concentrate in numbers larger than found in normal distribution. Social organizations operate in animal populations as shown by ants, bees, termites among insects, certain birds and fishes.

The distribution and growth of plants and animals in an ecosystem are controlled by both abiotic and biotic features of the environment. Any factor which affects the growth and survival of a populations is called limiting factor.

Ecosystem Resilience

In ecosystem, the substances are constantly flowing through it and there exist sufficient supplies of energy in it. The capacity of an ecosystem to self regulate to self maintain is called homeostatics (homeo-same, statis standing) or ecosystem resilience. Ecosystems have remarkable ability to resilience, i.e., to recover from certain degree of natural and man induced perturbations through feed back mechanisms.

Ecological Pyramids

In pond system the organisms at the beginning of food chain are relatively abundant, while those at the end are few. The trophic structure and function at successive tropic levels, i.e., Producers – Herbivores – Carnivores is known as ecological pyramid. These are of these types:

(i) Pyramid of numbers showing number of organisms at each level.

(ii) Pyramid of bionass showing the total day weight and total amount of living matter.

(iii) Pyramid of energy showing the rate of energy flow and productivity at successive trophic levels.

Cycling of Mineral Elements and Gases in an Ecosystem

The life on earth, including the plants and animals, the non-living environment such as land, water and air, the relationship of one individual with the other, the interaction of living and non-living organisms etc. constitute biosphere, the world of life. Green plants as well as animals enjoy a unique position in the biosphere. The energy that makes the living system work comes from the sun. Green plants are capable of locking the sun's radiant energy into food stuffs through the process of photosynthesis or earbon as assimilation:

$$\mathbf{6}CO_2 + 6H_2O \frac{h\nu}{Chlorophyll} C_6H_{12}O_6 + 60_2$$

Life is thus dependent upon the energy from sun. The food stuff produced by the green plants through photosynthesis is not only utilized by green plants and animals but oxygen, byproduct of photosynthesis is most essential for all organisms, chemical processes (respiration) that unlock the potential energy of the food stuffs. This indicates that animals, in contrast to the plantrs (prime producers), are the prime consumers. For example, sheep or rabbit feed directly upon plants, while animals like lion and tigers, depend upon rabbit and sheep. Thus sheep and rabbit are prime consumers, while lion and tigers are secondary consumers.

The atmosphere and nature waters must be replenished with CO_2. Most of the CO_2 is returned to atmosphere and natural waters by plants and animals through the process of respiration. Bacteria and fungi also return CO_2 to atmosphere and natural water into the soil by acting chemically upon the dead plants, animals and their wastes. Coal, petroleum etc. are also the part of CO_2 cycle and are formed in nature by living organisms.