9/01/2018 ZLY101 (Mrs OPegemi)

INTRODUCTORY ECOLOGY

Ecology is multidisciplinary

HISTORY OF ECOLOGY

In the year 1859, Hillaire proposed that the relationship that exist between organisms and the environment be termed ~~ecology~~ ethology.

In the same year St George Jackson Mivart said it should be Hexicology.

9 years Later, Reiter introduced Oekology. Gotten from greek word "oekos" — natural home/habitat "logos" — study

In 1869, Haecel defined oekology as the study of reciprocal relationship btw living organisms and their environment

In 1905 - Warming utilize the science of ecology to study

Ecology envolves living component and non-living component in the environment

In 1969, Odum define ecology as the study of functions and structures of ecosystem.

Ecology is a distinct field of biology

Ecology in Level of Biology

Ecology may be define as the Level of interaction between living organisms and their environment in the pattern of distribution of plant and animals on the earth crust

Scope of Ecology

* It covers the abundance and distribution of organisms
* It covers succession belonging to an ecosystem

Sub-division of Ecology

* Autecology: It is the study of individual specie. It is the same as population or specie ecology
* Synchology: is the study of many species
* Applied ecology:
* Physiological ecology
* Genecology

Importance of ecology

Agriculture, soil conservation, pest control, forestry, wildlife

Rough One

09/01/18

INTRODUCTORY ECOLOGY

In primitive society, every individual needs to have definite knowledge of the environment in order to survive. Ecology is one of the popular areas of sciences in biology. It is a pluralistic science in the sense that it depends on the wide variety of methods and approaches rather than a unlimited range of techniques and concepts. Ecology is multidisciplinary involving close co-operation from experts in several disciplines

History of Ecology

In 1859, a French Zoologist named 'Hillaire' proposed the term 'ethology' for the study of the relations of organisms with the family, society and community.

In the same year, an English Naturalist named 'St. George Jackson Mivari' coined the term 'Hexicology' which he defines as the study of relations which exist between organisms and their environments.

In 1868, 'Reiter' introduced 'Oekology' which was derived from two greek words "Oekos (house/dwelling place)" and "Logos (study of)" but he did not give any definition

In 1869, "Haeckel" defined Oekology as the study of reciprocal relations btw living organisms and their environment.

In 1901, Warming utilised the science of oekology for the study of plants. Later, the term oekology was replaced by ecology

Ecologist recognised that the biotic (living) and the abiotic (non-living) components are not only inter-related but they function in an orderly sequence as important component of a system.

Odum in 1969 preferred to define ecology as the study of the structures and functions of ecosystems.

The growth of this discipline as a distinct field of importance started in 1900. At first it was studied as plant ecology and animal ecology. The works of Clement F.E, Shelford V and several others established ecology as a unified biological science

DEFINITION OF ECOLOGY

The word Ecology was coined from a greek word 'Oekos' meaning house or dwelling place while 'Logos' is the study of.

Specifically it means the study of interactions of organisms with one another and its physical and chemical environment.

Ecology can be defined as the study of structure and functions of nature. It is the scientific study of interactions that determine the distribution and abundance of organisms.

In simple term, Ecology is the study of interaction between living organisms and their environment and the pattern of distribution of plant and animals on the earth surface.

Organisms exist not just as a single individual but in groups called POPULATION. Various population of organisms interact with one another to form a community. Interdependent community of organisms interact with the physical environment to make up an ecosystem.

Finally, all ecosystems of the Planet are combined to produce a level of organization known as Biosphere

SCOPE OF ECOLOGY

Ecology deals with the following aspects

1) Abundance and distribution of organisms i.e why Natural communities are composed of certain organisms and not others
2) How various organisms interact with each other and with the physical environment
3) Successional development of ecosystems
4) Life processes, interaction and adaptation
5) Movement of material and energy through living communities.

BRANCHES OF ECOLOGY

1) Autecology: It is the study of individual species in relation with its environment. It includes geographical distribution, morphology, life cycle, behaviour with reference to ecological factors and impact ~~work~~ of ecological factors on life cycle at different stages. It is also known as POPULATION or SPECIE ecology
2) Synecology: It is the study of groups of organisms in relation to their environment. It can be studied through the following branches
   i) Taxonomic ecology: the study of different taxonomic groups namely microbial, mammalian, insect ecology etc.
   ii) Habitat ecology: the study of animal and plant in different habitat eg fresh water, marine, terrestrial, forest, desert etc.
   iii) Applied ecology: It deals with application of ecological concept to human need including wildlife management, biological control, forestry, conservation of natural resources etc.
   iv) Physiological Ecology or Ecophysiology: It is the study of physiological adaptations according to ecological conditions. It involves the knowledge of how an organism adapt to extreme temperature.
   v) Ecological Genetics (Genecology): It is the study of the genetic variability of an organism in relation to the environment
   vi) Pedology: It deals with the study of soil, its nature (acidity, alkalinity, humus content, soil type etc)
   vii) Radiation ecology: It is the study of the effect of radiation on organisms

Autecology	Synecology
1) It deals with study of individual organism	It is the study of groups of organisms
2) It is also called Population ecology	It is called community ecology
3) Autecology study can be accomodated in the laboratory set up	It cannot be accommodated in the laboratory set up
4) Examples, study of population of zebra in relation to their environment	Examples, study of an entire grassland in relation to their environment

16-01-18

ECOSYSTEM

Primarily, ecosystems are classified according to their climatic features, predominant vegetations or plants and also according to organisms

Eg. Terrestrial Ecosystem

Terrestrial Ecosystem	Aquatic Ecosystem		
① Forest: Tropical, sub tropical, temperate, Mangrove swamp, alpine	fresh water: rivers, ponds etc, lakes, springs	Estuarine: coastals, lagoon	Marine: water, sea, coral reef
② Grassland / Savanna			
③ Desert			

e environment

Forest

Forest are dominated by woody plants like trees, shrubs, herbs, climbers. The forest ecosystem is mainly characterised by the arrangement of trees in successive layers which include an upper canopy layers (Emmergents), middle storey tree (low-canopy layers), shrub layers, herbaceous layer, litter layer/forest floor. This continuous layers canopy arrangement is what distinguishes forest vegetation from the savanna and it is the reason for the paucity of grasses. This vertical arrangement also provides many diff habitats for animals which occupy well defined feeding groups.

Tropical Rainforest

This is well represented in Amazon basin, Tropical Africa, Australia and Indo-Malaysia. It is in region with high rainfall and temperature, annual rainfal about 2000-2500mm. The most significant by tropical features of tropical rain-forest is the extreme specie difference and diversity. For example, South American forest have abundance Fabaceae, Malaysian forest are dominated by dipterocarpaceae

Vegetation Structure of Tropical Forest

① Emmergence: They could be 45-50m high. Their canopies grow above those of other trees and form a discontinous layer as they did not need to compete for light e.g Iroko (African teak), Mahogany (African walnut), Obeche (African white Wood)

② Middle Storey trees: They form the roof of rain forest with their crowns forming a continous canopy. They could be 25-35m above the ground.

③ Shrubs and herbs: They form dense closely packed layers with height of about 10-15m They also form a continous canopy below the middle stories

④ The litter layers: They contain wet and shade loving plants e.g mosses, lichen, liverwort, ferns

Climbers

① Epiphytes: They are plants that grow on surface of other plants.

② Lianas: They are wooden rope-like climbers with flexible stems.

These group of plants through their growth form have solve the problem of obtaining adequate light by using trees to support themselves. Although this arrangement cut them off from soil water and nutrient. They are able to adapt to this by possessing spongy roots to trap moisture. They can withstand dehydration. Some have high water storage capacity, many orchids have They have succulent leaves that absorb water

Distribution of animals in the forest

Tropical rainforest will provide homes to 90% of the world insects. The soil fauna is very rich and it doesn't include many mammals. Large species are scarce. However, there's a well developed fauna of insects, mammals and birds in the trees that are adapted to Arboreal life. e.g Lemur, Monkey, Squirrel, rodents etc. The birds here are brightly coloured and a lot of them eat fruits. Arboreal reptiles and amphibians eg Chameleon

Adaptive Features of Forest Plants and Animals

① Iroko and Mahogany, have strong tap root system and buttress root to aid anchorage and support the plant height.

② The bark of forest trees is usually thin as there's little need for protection against fire or cold and also to enhance gaseous exchange and transpiration.

③ They have broad dark green leaves for photosynthesis

④ Many Arboreal Mammals have powerful claws to hold on to trees

⑤ Monkeys and chameleon have long prehensile tail and for climbing trees and jumping

⑥ Bat have gliding membrane along the side of their body which is used for flight

⑦ Protective colouration by green snakes to avoid being detected

Savanna

They cover 1/5th of the land surface of the world and approximately half of the African Continent. They are found in Tropical region of Africa, Asia, America. They are predominated by grasses. The herbaceous layers consist of grasses of the genera Andropogon, Penisetum, Imperata. The sub-layer is represented by acacia (baobab) and Palms in Africa while in America is Cacti and Eucalyptus in Australia.

The fauna consist of mainly of large herbivores like antelopes, Zebra, Giraffe, Elephant and Carnivores like Cheetah, Lion, Leopard. In Africa, the flightless birds is Ostrich, Rhea in America, Emu in Australia. Monkeys and Birds also occur in trees there. Predominant insects here are the termite, locust

The Savanna is characterized by a long-cool-dry season and short hot-wet season. Seasonality is a distinctive feature of Savanna. Hence, inhabitive organisms are adapted to surviving seasonal extreme. In the wet season, the soil water content increases and ground water discharge may occur. The dry season, which often last for 3-7 months is the most important limiting factor for plant growth. Savanna grasses grow during the rain and set their seeds at the start of the dry season. After setting seed, the above ground part becomes moribund (inactive).

Bushfires are characteristics of all Savanna. Fire plays a central role in Savanna ecosystem. In fact, most African Savannas thrive (flourish) due to the impact of fire and large herbivore that feeds on them.

Plant Distribution of Savanna

Elephant Grass, Shea butter, Gamba grass, Baobab tree, acacia, rhizomes etc.

Savanna extends across Africa from North of the Congo basin in a broad belt to Senegal in the west and Sudan in the east. This belt is divided into three zones, Sudan, Sahel and Guinea Zone

One distinguishing difference is the large diversity of birds and mammal.

708 birds species have been recorded. They support the spectacular mammalian fauna on The lesser the chances of being attacked. Herbivores are divided into ⓘ Grazers ⓘⓘ Browsers

The best studied savanna and one of the largest National Park in the world is the Serengeti region of East Africa because it supports an enormous number of land Predator

Adaptation of Plant & Animal

① The above ground shoot of Perennial grass specie form a protective cover on the soil surface during dry season to reduce water loss from the surrounding soil.

② Most of the trees have thick and insulating bark to resist fire and to reduce transpiration

③ The Kangaroo grass and spear grass possess a hygroscopic mechanism which drill the seed into the soil where they are protected from destructive fire operation

④ Elephant grass have succulent stem to store excess water against dry season and strong fibrous root-system to absorb water from the soil

⑤ Herbivores have different feeding parts on the same vegetation

⑥ Elephants have the ability to tear open the trunk of baobab trees to suck water in dry season.

⑦ Rodents are dormant during dry season

⑧ Foxtails drongos feed on flame-roasted insects

Desert

Desert are barren ecosystem with scanty vegetation consisting mainly of thorns and bushes. They are found in areas of the world where the average rainfall is below 250mm per year. In some desert, the dew deposited during the cool night is the only source of water. Temperature and evaporation rate are usually very high during the day. The soil is sandy and rocky as there is no vegetation to improve the soil. The productivity of desert is extremely poor. There are limited and specialized consumers in the desert. There are few Vertebrate like antelopes, camel. The birds are largely flighted. Tenebrimoid beetle are the most important insect. Mantids of the genus eremiaphila are found in more arid region of the Sahara. Plants found there are Cactus, Date palm, Baobab tree, Wiring grass. They have no vegetative covers to reduce the speed of the wind. They have strong winds in desert

Adaptation of Plants & Animals

① Camel have long eye-lashes against sand

② Leafless plants like Cactus with thorns are present to reduce transpiration

③ They have thick succulent stem and side-branches to store water for long drought

④ Plants like wiring glass have narrow and slender leaves

⑤ Acacia is a drought-resistant plant with deep root to absorb underground water in the soil

⑥ The Kenyan Sand Boa lives most of its life burying under the desert sand or under a rock and comes out in the evenings and early morning when the sun is less harsh

⑦ The Desert tortoise has an oversized bladder that can carry extra water. Their feet are also adapted to walk in the sand.

⑧ Camels can drink a lot of water to sustain it for days

ECO

AQUATIC SYSTEM OF BIOME

Aquatic biomes account for the largest parts of the biosphere in terms of area.

Fresh water and Marine biomes are distinguished on the basis of their physical and chemical properties. Marine biomes generally have average salt concentration

of about 3% whereas Fresh water has concentration of less than 1%.

Marine Ecosystem

Ocean is separated into 4 major zones. These are the intertidal, the pelagic, benthic and the abyssal.

① The Intertidals zone are areas exposed alternately to the air during low tide and to ocean waters during high tide. This constant movement of water transport nutrients into and out of these areas which are usually rich in lives and major economic resources. It is also characterized by varying temperature and high forces of wave action that can dislodge the habiting organisms from their habitat. It is home to few to large plants and algae like sea weed. The organisms here are structurally adapted to attach to hard substrates.

Sea weeds possess hold-fast structures for attachment to the surfaces and mucilaginous cover to prevent dissociation.

Diatoms have air-spaces in their tissues and rhizoids for attachment to rocks. They also have air bladder for buoyancy.

Feeding worms clams another Crustaceans burying themselves in the mud and feed when the tide brings food. Crabs are capable of burrowing fast into the mud to protect themselves against predator and high tides.

Periwinkles have lungs for breathing and foot for attachment

② The Pelagic zone (Open Ocean): Most of the oceans water lies here. Nutrient Concentration is generally lower than coastal areas because the remains of plankton and other organisms sink into the lower benthic zone. In this zone there is a narrow layer of rapid temperature change called a thermocline which separates a warm upper layer (photic) from the cold lower layer (aphotic). Phytoplanktons grow and reproduce rapidly in the photic zone. Zooplanktons such as protozoans, worms, jellies, small larvae of invertebrate fishes graze on phytoplanktons. Most Planktons have adaptation like bubble-tracking spines, lipid-droplet, air bladders and gelatinous capsules that help them to float. Free swimming animals like Nektons can move against the current to locate food. Examples are large squid, fishes, sea turtles and marine mammals, Cartilaginous fishes like shark and Dogfish can retain urea in their body to cope with high salinity. They have swim bladders for buoyancy. They have streamlined body to aid their movement. Pelagic birds like Petrel and albatross can catch fish on open water.

③ Benthic zone: This is the bottom part of the ocean. The primary source of food is dead organic matter that falls from above. The water here is too dark for photosynthesis (No plant grow here).

Tropical Benthic Communities are extremely productive consisting of Bacteria, Fungi, Sea weeds and filamentous algae, numerous invertebrate fishes are also present here. Organisms in the Very deep Benthic

Communities (Abyssal Zone) are adapted to continous cold, extremely high water pressure, almost little or total absence of light and low nutrient concentration. Fishes here may have enlarged eyes to enable them see in dim light. They also have luminescent organs that attracts mate and prey.

Fresh Water Ecosystem

Eg River, Lake, stream etc. They are categorized into two classes based on their mobility

① Lentic waters (standing water/stagnant)

② Lotic water

Examples of Lentic waters are lake, ponds, swamps. Lotic waters are continously flowing in specific direction. Example are river, stream etc.

The Zones of Lentic fresh water are similar to those of the marine habitat. They have no intertidal zones. The 2 major zones in a Lentic fresh water are Littoral zones and the Limnetic zones. Littoral zone is shallow and well lit. It is closed to the shore. It contains many rooted and floaty aquatic plants eg Spirogyra, Chlamydomonas, water lettuce, water ferns, duckweed, zooplanktons. Other animals are water flea, water snails, flat worms, frogs, toad, duck, snake, Crocodile.

The Limnetic zone is the well lit open surface that is farther from the shore occupied by various phytoplanktons like algae & bacteria, zooplanktons like rotifers and small crustaceans that feed on phytoplanktons. The zooplanktons are consumed by many small fish which also become food for large fish, semi Aquatic snakes and turtle and fish-eating birds.

A third zone calle the Benthic zone or profundal zone is the deepest part of the lake. The plants here have well developed root system e.g water lily, water arum, ferns, Commeline and grasses. Animals here are Protozoans, rotifers, Caddish fly larvae, catfish, Tilapia, leeches, larvae and pupa of mosquito, water snail, water spider, water Scorpion.

Lakes can also be classified according to their organic matter content.

Oligotrophic is deep and poor in nutrient

Eutrophic are shallower and higher in nutrient

Mesotrophic have moderate amount of nutrient

Lotic Zones are classified into 2:

Pool zone: The water here is relatively slow and calm

Rapid Zone: The water here is fast flowing

Adaptations of Plants and Animals to Aquatic lives

① Water lily has air bladder and light weight to keep it floating

② Spirogyra has mucilagenous cover for protection

③ Water lettuce have hair on their leaves to trap air and to enable them float

④ Ducks have webbed feet for locomotion in water and serrated beaks to filter food from water

(5) The Lung fish digs into mud in dry season and breathe with its lung until the rain comes.
(6) Swim bladders by fishes for buoyancy
(7) They have gills for respiration
(8) Protozoans have contractile vacuole for Osmoregulation

ESTUARINE

They are areas or portions of rivers. They are the mouth of rivers where river water meet with ocean water. They have fluctuating salinity. They are rich in nutrient and usually abundant in fish. They are used as breeding site for many commercially important fishes. Mosquito larvae and pupae process breathing trumpet for gaseous exchange, water snail and shrimps that can burrow into the mud

30-01-[illegible] THE ENVIRONMENT

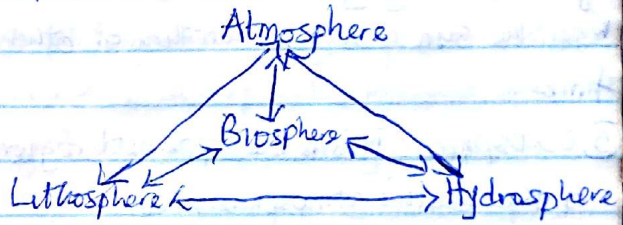
The word environment was derived from French word 'environia' meaning to surround. Environment is defined as the sum total of water, air and land and the interrelationship that exist among them and, with the human beings, other living organisms and materials.

Concept of Environment

The combination of factors that co-exist in the habitation of an organism is said to the component of the environment.

The entire environment of planet earth can be divided into 4 major subsistence called spheres. These are
(1) Biosphere (the living organisms on earth)
(2) Atmosphere (the gaseous envelope surrounding the planet)
(3) Hydrosphere (the liquid water on the surface of earth)
(4) Lithosphere (the stony or rocky matter comprising the bulk of the surface of the earth)

There is interaction among the 4 components of the environment because matter cycles and energy flows through these spheres.



Atmosphere

It is a complex fluid system of gases and suspended particles. It is the gaseous cover on the surface of the earth. It consist of a mixture of gases principally Nitrogen (78%), Oxygen (21%), CO_2 (0.03%) mixed with water vapour and is collectively called air. It also contains numerous other gases in trace amount and floating particulate matter such as dust, soot, pollen grains, etc.

Vertical Structure of the Atmosphere

(1) Troposphere: It is the layer where living organism exist and operate. It has strong air movement and wind. It is the lowest layer of the atmosphere
(2) Stratosphere: This is the 2nd layer of the atmosphere. It is the air mass extending just above the troposphere and below the mesosphere. This layer is free from clouds and aeroplanes usually fly in the

lower zone:

(3) Mesosphere: It is the layer directly above the Stratosphere and below the thermosphere. It has the coldest temperature in earth atmosphere (about -90°C or -130°F). Weather balloons and other aircraft cannot fly high enough to reach the mesosphere

(4) Thermosphere: It is the layer directly above the mesosphere and below the exosphere. It is characterized by an increase in temperature. It is typically about 200°C (360°F), hotter in the daylight than at night and roughly 500°C (900°F) hotter when the sun is very active than at other times.

(5) Exosphere: This is the uppermost region of the earth's atmosphere beyond the thermosphere. This layer gradually fades into the vacuum of space. Air in this layer is extremely thin

Hydrosphere

This include surface water and its surrounding interface. The oceans, lakes, rivers, streams, polar ice caps, water vapour etc forms the hydrosphere. The water remains in solid (snow), liquid (water) and gaseous (water vapour) forms

Lithosphere

This is the solid outer part of the earth. It has 3 main layers

(1) the earth crust: It is in the solid state and has a thickness of 16-50 km

(2) the mantle: It is about 2880 km thick and is made of hard rock containing Iron and Magnesium and forms about 84% and 67% of the earth's volume and weight respectively

(3) the core: It is composed of high density solid material mainly Iron and nickel, with the temperature of about 8000°C.

Lithosphere forms the major portion of the soil on which all terrestrial plants grow. It provides majority of minerals required for plant metabolism.

Biosphere

This encompasses all the zones on the earth in which life is present i.e entire bio-resources of the earth. At the top of the lithosphere, throughout the hydrosphere and into the lower atmosphere, life of diverse type exists. This bio-resources and their surrounding constitute the biosphere, where mankind, acting as the most evolved creature

ENVIRONMENTAL FACTORS

They are also refered to as ecological factors. They are the factors the influence the living organisms. They can be classified into 2 major groups.

(1) Abiotic / Physical factors

(2) Biotic factors

ABIOTIC/PHYSICAL FACTORS

These are the non-living chemical and physical parts of the environment that affects living organisms and the functioning ecosystem.

They are further divided into the following categories

Environmental Factors and their distribution of Influences on animals

① Climatic factors: These varies in their distribution from one ecological zone to the other. Therefore floral and faunal maintain balance in nature as a result of the abiotic factors.

Climatic factors include: Precipitation (rainfall), temperature, atmospheric humidity, wind and light

② Physiographic factors: These are the factors that have their origin in the form, behaviour and structure of the earth surface

The chemical and physical constituents of the soil and some other factors make up the structure of the earth. Physiographic factors can be further categorized as

a) Topographic factures: this deals with the form and behaviour of the soil. Topography is the description of the physical features of a place. It describes configuration of the ground, its altitude, slope, aspect etc.

b) Edaphic factors: This deal with the structure of the soil, their ecological influences or properties of the soil brought about by its physical and chemical characteristic

c) Geological substration: This is the earth layer that lies beneath another layer.

BIOTIC FACTORS

These include all living things and inter-related actions and reactions which individual organisms directly or indirectly impose on each other. Plants and animals in any community form a closely knit and their interdependent unit, therefore, it is difficult to isolate the components and effects of individual biotic factors of the environment.

① Rainfall: When rain falls, some of the water sinks or percolates into the ground and saturates the earth to a certain level. Rainfall supplies water to animals especially desert animals. Excessive rainfall is not ideal for animal production.

Effect of water on Aquatic Animals

Water has 2 major effects on aquatic animals

① Effect of Pressure on Organisms

② Effect of structure and size

Effect of Pressure on Organisms

The pressure in water increase as the depth increases. For every 10m (33ft) increase in depth, the pressure increases by 1 atm or 760mmHg.

The increase in pressure in depth causes serious consequences in all aquatic organisms. Animals living at the bottom of the sea are already adapted to that environment because the pressures inside their body remains the same as that of the outside. This is the reason why when deep sea animals are brought to the surface, they die immediately due to sudden change in pressure.

There are different effects on organisms having air-filled cavities and those who do not possess the air cavities. Animals without air bladders are not harmed by moderate pressure changes. Therefore their vertical distribution is not affected by pressure changes. Several species of invertebrates are found from the surface down to 4000 - 5000 m

operate. For animals (10-45°C)

Some fishes undergo diurnal vertical vibration daily, subjecting themselves twice daily to change of pressure. Such organisms possess fluid-filled cavities in their bodies to avoid mechanical deformation caused by pressure changes.

Problem of breeding is added to increased pressure for diving mammals and birds. They do not have the source of oxygen during the period of their dive. Whales withstand great pressures by keeping their lungs completely flattened and the contained air is forced into the Larynx. Whales can dive 200-400m regularly and can stay sub-merged for 20minutes normally. Seals can store an increase amount of oxygen in their tissues and this oxygen is reserved for the brain, heart and other vital organs by cutting of circulation to other part of the body

Adaptations of terrestrial animals to water include:

① Body covering which limits loss of water. Some animals have sweat glands which are used as cooling devices

② The tissues of some animals like camel are tolerant to water loss

③ Some insects absorb water from the water vapour directly from the atmosphere.

④ Temperature: Animals can function efficiently only within a very narrow range of temperature called the Biokinetic zone. The biokinetic zones for most animals lies within 10-45°C. Animals have develop distinct regulatory mechanisms to adapt to temperature stress, since the environmental temperature range is very low at -79 to 95°C

a) Poikilothermy: Lower animals are thermoconformers. The body temperature changes with the environmental temperature. The physiological activities are adapted as to function inspite of temperature stress. Poikilothermic animals are also called ectothermic or cold blooded animals

b) Homothermy: Higher animals are thermoregulators and are able to maintain a constant body temperature. Only birds and mammals are able to maintain a constant body temperature. This is kept between 36-42°C. Each species has its own normal body temperature which is maintained quite accurately even under extreme climatic conditions.

The phenomenon of maintenance

06-02-18 EFFECT OF STRUCTURE & SIZE

Supportive structures are greatly reduced or completely lacking as water provides the necessary buoyancy to the organisms. The elaborate skeleton present in aquatic animals is for some other purposes than support. The hard shells of crustaceans and molluscs are for protection. In fishes, the skeleton is used for the attachment of muscles. Many aquatic organisms like Jelly fishes do not have skeleton. Marine animals attain larger sizes than ever existed on land.

of a constant body temperature is called homoiothermy. Homothermic animals are also called endothermic or warm blooded animals.

Seasonal movement occurs in some animals. This phenomenon is called seasonal migration. Examples of such animals are migratory locust, butterflies and various marine animals like whales, penguins and marine turtles.

Seasonal changes have a great influence on animal lives in an ecosystem. Torpor (inactivity) in winter is common in reptiles and some mammals in South Africa, but a winter sleep occurs in bears of the Northern hemisphere. Some animals collect fats or other resources during favourable periods (often Summer and Autumn) and become dormant (it is called hibernation) There are also animals that are dormant during warm and dry conditions (this is known as Aestivation) e.g Snails and the African Lung fish.

Lower temperature causes a decrease in the activities of animals, especially poikilotherms. Except the snow flea, certain Collembola, the crowds are seen swim on the surface of snow. Some primitive animals exhibit thermotaxis (orientation towards heat source). Ticks locate their homothermic host by a turning reaction to the heat of their bodies. Leopard frog is stimulated to burrow into the mud bottom of the pond when the temperature drops below 5°C. Some fishes aggregate at lower temperatures and becomes separated when the water becomes warmer. Similarly, snakes aggregate and form balls in the retreat in the rocks in cold weather.

③ Light (Sunlight) is the primary source of energy nearly all ecosystems. It is used by green plants during photosynthesis.

Light affects the distribution of animals in a number of ways:

① Pigmentation: The skin colour is indirectly affected by light through the mediation of the eyes and other receptors. The characteristic lack of pigment in cave animals is associated with darkness. After exposure to normal day light, blind cave animals (amphibians) and fishes with little or no colour have been found to develop abundant pigment in the skin.

② Photokinesis: It is a phenomenon in which light controls the locomotory activities of many of the lower organisms by a direct action upon their speed of locomotion. For example, the larvae of mussel crab swam the length of 29cm trough towards a light of 0.5m candle in 34 seconds and at 46 cm candle they made the trip in 17 seconds.

③ Vision: Many aquatic animals may show some activity response to increase or decrease of light. Studies of the diurnal vertical migration of Zooplanktons indicate that certain species may react to

light on the surface at 800m and possibly at 1000m or more than half a mile down.

(4) Orientation: Tropism is orientation by growth or turgor movement exhibited by sessile animals. Geotropism is the orientation to gravity. Phototropism is the orientation to light. Orientation of the locomotion of motile organisms is referred to as Taxis.

In a positively phototactic swimming insects (Ranatra), if the left eye receives more light than the right eye, the legs on the left side of the body will be more strongly flexed whereas the legs on the right side of the body will be more greatly expended and with longer sweeps.

4) Wind: Winds are known as air current. They're formed due to the uneven heating of land and water and the large temperature differences between the equator and the poles.

Winds help in dispersal of cysts and many animals. Flight animals are very few in the areas which have high speed winds. Wingless insects are present while the winged insects are absent in such areas. A few birds form a very strong nest which allows the birds to survive in the high wind area. The nest are built in the rocks and stones.

Small insects need to adapt to wind speeds. Weak winds greater than 0.2 m/s have effect on the flight and landing behaviour of bug (Protephasius truncatus). Anopheles maragora (mosquito in the open landscape of Brazil, can only freely navigate in air with windspeed below about 0.85 m/s (3 km/hr). Males of Aphis parasitoid parasitoid are Aphidus nigripes do not reach females at wind speed of 1.0 m/s. In summer, when mosquito abundance is enormous in the Arctic, Reindeer and Caribou select windy locations for resting and rumination, preferably close to the seashore, ungravel pads in large rivers. So

Some spider species let themselves drift away (ballooning) to explore new habitat using a short thread that releases their updraft and thus drifting distance at higher windspeeds.

At a much larger scale, many long distance migratory birds species have adopted flight treat that best profit some large scale wind fields on the earth, which saves energy and thus increases the survival rate. However, migratory birds faces strong 'earth winds' they suffer severe losses, if such an occurrence combines with low temperature, scarce food resources etc

13-02-2018 BIOTIC COMMUNITIES

In an environment, different types of plants and animals exist in close association and show interdependence. An actively interacting group of a number of different populations of several species in a common environment is known as biotic community. In other words, it is a group of several populations of different

species which are interdependent. It contains only those species which are successfully adapted to that environment and some other species in the area. The assemblage of plant species in a habitat is called plant community, That of animal species is called animal community while that of microbes is referred to as microbial community.

Characteristics of Biotic Community

(1) Interdependence: The animal, plants and microbial communities depends on each other be it in form of nutritional interdependence, $CO_2 - O_2$ interdependence, interdependence in pollination and dispersal of seeds

(2) Species diversity: The community is made up of many spp of plant and animals and microbes which vary from community to community. Spp diversity measures the number of species in the community (spp richness) and their relative abundance.

(3) Predominance: Among several species present in a community, a few exert a major controlling influence by virtue of their size, numbers or activities. These are called dominant species.

(4) Succession: Each community has its own developmental history as a result of directional replacement of one community with another community over time.

(5) Trophic structure: The community is characterized by definite trophic levels i.e producers, consumers and decomposers

(6) Stratification: major categories of growth forms (trees, shrubs, herbs etc) determine the zonation and stratification of the community. In a forest community, the tree tops, branches, leaf litter, and soil form are examples of distinct

A pond community has surface dwellers, bottom dwellers and those living at intermediate depth

Classification of Biotic Community

(1) Producer (1st level): This is the lowest level in the trophic system comprising of autotrophs such as green plants, algae and the bacteria. This trophic level ultimately support all others. Microscopic algae and blue-green bacteria which are the main producers in aquatic ecosystem are known as phytoplanktons. They utilize the sun's energy and nutrients gathered from the soil or water to synthesize organic compounds which serves as fuel for cellular respiration and the building material for growth

(2) Primary Consumers (2nd Level): They feed on producers (plants). So they are called herbivores. Some do not eat the producer but lives as plant parasites e.g aphids, some fungi, and other plant such as mistletoe which parasitizes its host tree for nutrient. Examples of primary consumers are goats, sheep, cow etc.

(3) Secondary Consumers (3rd Level): They feed on primary consumers and are called Carnivores. Many secondary consumers also eat plants which make them omnivores.

(4) Tertiary Consumers (4th Level): They include carnivores, which eat secondary consumers. Secondary and tertiary consumers may be predators, carrion feeders and parasites

(5) Apex Predator/Quaternary Consumer (5th level): They prey and eat carnivores and herbivores. They are at the top of the food chain and have no predators of their own. Examples are lion, alligators, bear, anaconda, hawk etc.

6) Decomposers/Reducers/Detritivores (6th level): They are consumers that get their energies from detritivous (non-living organic material such as remains of dead organisms, fallen leaves, wood etc. They are microorganisms mainly fungi and bacteria which lives as saprotores and recycle nutrients which are re-used by producers. In other words they link the consumers and the primary producers in an ecosystem.

Building up a food chain base on detritous is called Detrital food chain e.g

Leaf Litter → earthworm → Black bird → Hawk.
Detritous
Dead animal → Blowflies → Frog → Snakes

ENERGY FLOW

The sun is the ultimate source of energy. 40% of the sun energy is reflected from the cloud, atmosphere and earth surface without having any heating effect. 15% is absorbed and converted to heat energy in the atmosphere. The remaining 45% (5×10^6 KJ/m²/yr) of the incoming energy penetrate the earth surface only half of that radiation is in the photosynthetically active range (par) however, under optimum condition, only a small proportion of incoming radiation (10%) is converted to organic molecules through photosynthesis. The rate at which this chemical energy is stored by plant is called gross primary productivity (GPP). The Net gain of organic material in photosynthesis after allowing for loss due to respiration is called Net primary Productivity (NPP). The energy remaining in heterotrophs after losses through egestion, excretion and respiration that is available for growth, repair and reproduction is called Secondary Production.

FOOD CHAIN

The organic molecules produced by autotrophic organisms are the source of food for heterotrophic organisms. These animals may in turn eaten by other animals and in this way energy is transferred through a series of organisms each feeding on the preceding organism and providing raw materials and energy for the next organism. Such sequence is called food chain or grazing link. Food chain shows the linear relationship btw producers, consumers and decomposers showing who eats whom with arrows. The arrows show the movement of energies through the food chain. e.g

grass → grasshopper → Toad → Snake → Hawk
Diatom → mosquito larvae → Tilapia fish → whale

FOOD WEB

Feeding relationship becomes more complicated when animals eat more than one type of food. A food web is a non-linear set of interaction or a mesh of inter-connected food chain showing the complex flow of energy in nature.

21-02-2018

TROPHIC LEVEL

Each stage or the feeding position in a food chain/web are called trophic level. The 1st trophic level is occupied by autotrophic organisms called producers. Organisms in 2nd trophic level are called primary consumers while those in the 3rd trophic levels are called secondary consumers and so on. There are usually 4 or 5 trophic levels in every food chain. This is partly because, at every stage,

Elton C.E in

some energy is wasted from the chain of animals feeding on each other. Other factors that limit the length of food chain include: the availability of sufficient food of the preferred type, temporal space which restrict the end of chain organisms and thus the length of the food chain.

Ecological Pyramid

This is a graphical representation designed to show the number, biomass or bio-productivity at each trophic level in a given ecosystem. In other words, it shows the feeding relationship and the efficiency of energy transferred through a biotic community diagramatically. It is the fundamental basis for

① Comparing diff ecosystems
② Seasonal variation within a particular ecosystem
③ Change in an ecosystem

Note: The idea of ecological pyramid was advanced by Elton C.E in 1927.

There are 3 types of pyramids

① Pyramid of Number: It shows the relationship in terms of number of producers, herbivores and carnivores at each trophic level. There is a decrease in the number of individual from the lower to the higher trophic level i.e the producers are eaten/ingested in large number by smaller number of primary consumers. These primary consumers are eaten by relatively smaller number of secondary consumers and secondary consumers are in turn, are eaten by only few tertiary consumers. These are 3 types.

POPULATION ECOLOGY

Demography is the parameter to describe population

Characteristics of Population

① Population size & density: Population size is the actual number of people in a particular area

Low Population

* They are likely to go into extinction
* Natural Disaster can clear them off
* Tendency for random death

Large Population

* They can't go beyond their carrying capacity
* The spread of disease and competition
* It reduces the fecundity rate
* It causes degradation of habitat

Population Density

Space occupied by a population in respect to their numbers. Density is dynamic. It often change by

① Birth rate
② Death rate
③ Emigration
④ Immigration

> Migration

In a closed population, the only determinant is birth rate and death rate only

Density Dependent Factor

They increase as population density increases and decrease as population density decreases eg food, oxygen, space, light

Density Independent Factor

They don't have anything to do with population growth eg natural disaster

Metapopulation is a network of distinct but interacting specie

Dispersion / Distribution of Population

The m

eg Availability of food, temperature

Animals clump for:
(i) Mating (ii) Safety (iii) environmental factor requirement

Uniform Distribution Pattern

It is evenly spread pattern of dispersion. Territoriality is maintained

Random / Spacing Pattern

There is no territoriality

$\Delta r = b - d$

$N_i = N_0 + \frac{\Delta N_t}{\Delta t}$

$\frac{dN}{dt} = b - d$

$= bN - dN$

$= N(b-d)$

$\frac{dN}{dt} = rN$

$\therefore N_i = N_0 + rN_0$

$N_1 = N_0(1+r)$

Logistic equation for exponential growth

$N_t = N_0 e^{rt}$

Growth model

(i) Logistic growth model (S-shaped curve)
(ii) Exponential growth model (J-shaped curve)

Limited growth is describe here

Logistic growth model: Animals will continue to grow until it reaches its carrying capacity.

$\frac{dN}{dt} = N_0 e^{rt} = rN$

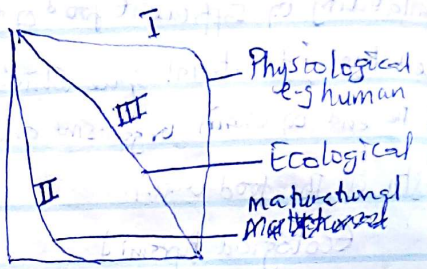
Exponential growth model: Animals will always continue growing. Unlimited growth is described here

$\frac{dN}{dt} = rN \frac{(k-N)}{N}$

Survivorship

This means the number of individual that can survive for a period of time

Survivorship curve



(i) Physiological survivorship is when lower death rate is experienced in young animals and higher death rate in old age eg human

(ii) Maturational survivorship is the reverse of physiological survivorship eg wheat plant

(iii) Ecological survivorship means death can occur at any time eg bird

7/03/2018

ECOLOGICAL SUCCESSION

Ecological succession is the series of changes in an ecosystem when one community is replaced by another community as a result of changes in biotic and abiotic factors. It can also be referred to as the process of change in the specie structure of an ecological community over time.

Succession occurs in all types of ecosystem. It can regenerate a damaged community or it can create a community in a previously uninhabited area and it may takes hundred or thousand of years.

Individual succession or a particular recognized succession or the whole sequence of communities that replace one another in a given area or site is called "sere". While the developmental changes or phases in the process of succession are called "seral stages". The communities of

The pioneers break down the soil to create environment

a sere are called 'seral communities'.

Succession starts with pioneers which are the first organisms that invade a bare area. Pioneers are the earliest seral community on a site. Succession ends with a climax. The climax community is the community with which a succession ends and in which species perpetuate themselves through reproduction. It is considered to be the most complex, diverse and productive community a given area can sustain. It may vary seasonally or fluctuate in a minor way but it is essentially stable unless some catastrophic intervention occurs.

Types of Succession

① Primary succession
② Secondary succession

Primary Succession

This occurs in essentially lifeless areas. In regions in which the soil is capable of sustaining life or in areas with no soil as a result of features such as lava flows, newly formed sand dunes, or rocks left from a retreating glacier of ice that originates on land by the recrystallization of Lakes and masses. It is a very slow process.

Pioneers species are the first organisms of primary succession to live in inexist areas. They help to create soil by breaking down rock particles into smaller pieces. The process of primary succession starts with the arrival of living things such as lichen and mosses that do not need soil to survive. As lichens and mosses dies, they decompose and they add small amount of nutrient to the rock particles creating soil. During the early stage of succession, there are not many habitat and therefore not many organisms are found in the environment. As soon as there is enough soil and nutrients small plants such as flowers, ferns, grasses grow which helps in primary succession. When the plant die and decompose, they further help breakdown the rocks and add nutrient to the soil. Due to primary plant succession, habitat are being created for small animals like insect and small mammals. Over time, as the animal dies and decompose their body adds nutrient to the soil allowing larger species to populate the area, thereby larger animals follow larger plants.

Eventually, a matured community is formed and this is called climax community. The climax community is able to maintain itself for long period of time with few changes in the specie that populate it.

Succession that takes place where water is abundant or starts originate from aquatic habitat is called hydrarch and the whole sequence of developmental stages constitute hydroseres. Plants found in such areas require large amount of water and are called hydrophytes. Animals community will include the fishes, the water beetles and the freshwater concentrates.

Haloseres is succession in a saline environment eg salt marsh. Marine algae and sea lettuce are early colonizers

Xerarch succession is a form of succession that take place in areas where there is scarcity of water i.e succession beginning in dry situation. The different stages of the sere constitutes xerosere. Two types of xerosere are distinguished mainly Lithosere (originating on bare rocks) and

Psammosere (occur on sand)

Secondary Succession

This is the succession that starts in an area that was previously colonized, but has been cleared off either by natural disasters, human activities or death of organisms. It is a process of repairing a damaged ecosystem. It is a much faster process than primary succession because soil is already present. It is a never ending process. Any disturbance in ecosystem results in secondary succession starting over. If there is frequent disturbance of ecosystem, that ecosystem will not be able to support large trees and animals. So it will consist of animals typical of the early stages of succession. It is very similar to primary succession but it does not require soil-forming pioneer species. The series of the developmental stages are called subsere

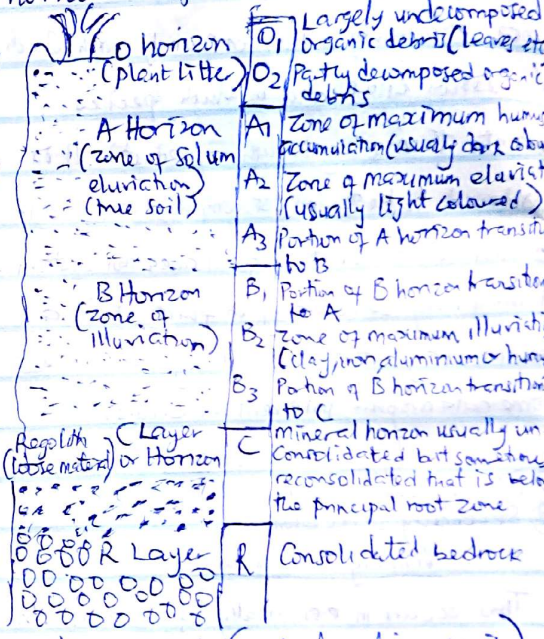
SOIL PROFILE/HORIZON

Soil is a natural product formed from weathered rock by the action of climate and living organisms. The four important component of soil are called:

1. Mineral matter (40% by volume)
2. Organic matter (about 10%)
3. Soil water (about 25%)
4. Soil air (about 25%)

A vertical section of a well developed soil shows the presence of a number of distinct layers called Horizons. Each horizons may vary in thickness, colour, texture, structure, porosity, acidity and composition. The sequence of succession of horizons from the surface downwards is called the soil profile.

Generally, soils have 4 main horizons: an organic or O-horizon and 3 mineral horizons, namely A-horizon, B-horizon and C-horizon. Below these, there may be R-horizon, the consolidated bedrock. These horizons are further subdivided



A Soil Profile (vertical section of soil)

Elluviation is the removal of suspended materials from dissolved soil by movement of water. Illuviation is the accumulation of suspended materials of dissolved soil as a result of leaching