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BIO 261 I NTRODUCTION TO ECOLOGY

AUGUST 22, 2021

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INTRODUCTION

The word ecology comes from the Greek word “oikes” meaning dwelling place or home so Ecology is the study of organism at home. Biologists usually define it as the study of living organism in relation to their environment, It is also known as environmental biology. Sarojini T. Ramalingam, BSc (Hons.), PhD (1990): Ecology is a practical science. It involves measuring factors affecting the environment, studying of living organisms and finding out how living organisms depend on one another and their non-living environment for their survival. As living organisms, we are also part of the environment, interacting with other living organism and the non-living organism. As organisms who make the greatest impact on the environment, we need to study organism, This will help us to understand how we affect our environment, and so enable us to utilize its resource wisely.

CHAPTER 1

RELATIONSHIP AMONG PLANTS AND ANIMALS ON BIOTIC ECOLOGY COMMUNITY

A biotic community is a naturally occurring group of plants and animals living in the same environment.

The ways in which certain animals and plants have evolved in some cases to make them interdependent for nutrition, respiration, reproduction or other aspects of survival increasingly the realm of ecology involves a systematic analysis of plant-animal interactions through the considerations of nutrient flow in food chains and food webs, exchange of such important gases as oxygen and carbon dioxide between plants and animals, and strategies of mutual survival between plant and animal species through the processes of pollination and food dispersal.

A major example of animal-plant interactions involves the continuous process of photosynthesis and cellular respiration. Green plants are classified as ecological producers, having the unique ability, through photosynthesis, to take carbon dioxide and incorporate it into organic molecules. Animals are classified and consumers taking the products of photosynthesis and chemically breaking them down at the cellular level to produce energy for life activities, carbon dioxide or waste product of this process.

MUTUALISM

Mutualism is an ecological interaction in which two different species of organisms beneficially reside together in close association, usually resolving around nutritional needs. One example is a small aquatic flatworm that absorbs microscopic green algae into its tissues. The benefit to the animal is one of added food supply. The mutual adaptation is so complete that the flatworm does not actively feed as an adult. The algae, in return, receives adequate supply of nitrogen and carbon-dioxide, and are literally transported throughout tidal floats in marine

habitats as the flatworm migrates, thus exposing the algae to increased sunlight. This type of mutualism which verges on parasitism in called symbiosis.

CO-EVOLUTION

Co-evolution is an evolutionary process wherein two organisms interact so closely that they evolve together in response to shared or antagonistic selection pressure. An example of co-evolution involves the yucca plant and a species of small, white moth.

The female moth collects pollen grains from the stamen of one flower and transports these pollen loads to the pistil of another flower, thereby ensuring crosspollination and fertilization. During this process, the moth will lay her own fertilized eggs in the flowers, underdeveloped seed pods.

The developing moth larvae have a secure residence for growth and a steady food supply, thus both species benefit.

MIMICRY AND NON-SYMBOLIC MUTUALISM

In mimicry, an animal or plant has evolved structures or behavior patterns that allow it to mimic its surroundings or another organism as a defensive or offensive strategy. Certain types of insects such leaf hopper, stick insect, and praying mantis often duplicate plant structures from in the environment, ranging from tropical rainforests to northern coniferous forests. Mimicry of plant hosts provide these insects with protection from their own predators as well as camouflage that enables them to capture their own prey readily.

POLLINATIONS

Because structural specialization increases the possibility that a flower’s pollen will be transferred to a plant of the same species, many plants have evolved a blast array of scents, colors, and nutritional products to attract pollinators.

Another source of animal nutrition is a substance called nectar, a sugar-rich fluid produced in specialized structures called nectarines within the flower or on adjacent stems and leaves. Some flowers have evolved distinct pleasant odours reminiscent of rotting flesh or faeces, thereby attracting carlon beetles and flash flies in search of places to reproduce and deposit their own fertilized eggs.

CLIMATE CHANGE AND ITS INFLUENCE ON BIODIVERSITY

The word climate refers to the long term weather patterns within defined region including temperature, humidity, wind, amount and type of precipitation.

Climate change refers to significant and long term changes to a regions climate. These changes could be occurring over a few decades or millions of years. Climate alters the entire ecosystems along with all plant and animal life. As climate changes, living creatures have to adapt, move or die out. When these changes occur gradually, ecosystem and species are able to evolve together. A gradual change also gives the species the opportunity to adapt to new conditions, but when the change happens very quickly, the ability of species to adapt quickly enough or relocate is a big concern.

All of these climate changes affect life on earth. Species have evolved to survive with certain temperature ranges and are able to tolerate variations in weather, the effects of climate change may push some species to the edge extinction while other species may flourish.

Warmer spring temperatures may cause birds to begin their seasonal migrations or nesting and cause bears to emerge from hibernation earlier than usual. When bears emerge before their regular food sources are available, 80 percent of bears diets are made up of plants, they may starve or wander into towns in search of food. For these animals that rely on late summer plants to survive through the winter; warmer, dryer summers may affect their ability to find food.

Animals that require cooler temperatures are shifting their ranges to higher elevation or towards the poles as the temperatures in their home ranges rise. The

American pika, a small mammal related to rabbits and hares, is adapted to life in the alpine environment. They are extremely sensitive to temperature and can die when temperatures reach 78 to 85 degrees Fahrenheit.

GREEN HOUSE GASES (GHGs) AND CLIMATE CHANGE

A major reason to implicate human or anthropogenic activities for climate change is the fact that those are closely linked to greenhouse effect.

Green house sources include the process of industries burning fossil fuel for energy and transportation (both release CO2), generation of methane (CH4) by landfills, volcanic eruptions and fossil fires. These greenhouse gases from all sources mix in the atmosphere and affect the biodiversity.

RISING TEMPERATURE (GLOBAL WARMING) AND ITS EFFECT

As the earth warms and temperature rises, regional climates are affected in different ways. Some areas of Southeast Asia are experiencing heavier monsoons and rising sea levels, while other areas; such as Southern Africa and the American Southwest are experiencing more severe droughts and crop failures.

Warmer temperatures result in increased evaporation which leads to heavier rainfall and snowfall, but increased precipitation in unevenly distributed, leading to heavier rainfall and drought.

INFLUENCE ON ANIMALS

Warmer temperatures on land and sea result in; more intense storms, increasing rate and size of floods, reduced snow pack, more frequent droughts, and rising sea levels.

Coral reefs which serve as habitat for thousands of marine species are being destroyed by bleaching due to ocean acidification. This destruction of marine life is a threat to the entire ecosystem; humans included.

EXTREME WEATHER EVENTS

Massive heat waves and drought have already grown more prevalent across the globe, expected to become more severe if the warming trend continues. In drought areas, habitats are altered, plants and forests suffer from lack of water, increased wildfire activities due to hot and dry conditions, this poses a risk to the safety of wildlife. Stronger and more frequent storms affect the distribution and concentration of the low links on the marine food chain.

MELTING SEA ICE

Arctic temperatures are rising twice as quickly of that of the rest of the world and sea ice is melting at an alarming rate. Some of the world's iconic species like polar bears, ringed seals, emperor penguins, etc experience distinct pressure due to melting sea ice. For these species, disappearing ice disrupts the food chain, hunting habitats, reproduction, and protection from predators.

INTERRUPTED SEASONAL CYCLES

So many species are dependent upon climate to guide the patterns of their lives, like mating, reproduction, hibernation, and migration, to name a few. As these patterns shift to reflect changing climate, it causes a ripple effect and hampers the health of the entire ecosystem.

CHAPTER 2

STRATIFICATION AND ECOLOGICAL NICHE IN THE BIOTIC COMMUNITY

STRATIFICATION

The vertical layering of an habitat, the arrangement of vegetation in layers it classifies the layers (sing...strata) of vegetation

Largely according to the different heights to which their plants grow.

ECOLOGICAL NICHE

NICHE: The most widely accepted definition was one by Hutchinson (1957) The NICHE is the set of BIOTIC and ABIOTIC conditions in which a species is able to persist and maintain stable population sizes. Two issues are recognizable from this definition

(a) Functional role of an organism

(b) Its position in time and space.

Ecological niche is a term for the position of a species within an ecosystem describing both the range of conditions necessary for the persistence of the species and it's ecological role in the ecosystem.

Ecological niche is a central concept in the ecology of organisms and is subdivided into

1. Fundamental niche

2. Realized niche

Fundamental niche: the set of environmental conditions under which a species is able to persist.

Realized niche: This is the set of environmental plus ecological conditions under which a species persists.

TROPHIC FEEDING LEVEL IN ECOLOGY

The trophic level of an organism is the number of steps it is from the start of the chain. A food web starts at trophic level 1 with primary producers such as plants can move the herbivores at level two carnivores at level, three or higher and typically finish with apex predators at level 4 or 5.

The first and lowest level contains the producers the green plants. The plants or their products us consumed by the second level organisms the herbivores or the plant eaters. At the third level primary carnivores or the meat eaters eat the herbivores, and at the fourth level the secondary carnivores eat primary carnivores.

CHAPTER 3

NATURAL DISASTER, ITS CAUSES AND EFFECTS

NATURAL DISASTER

This is a major adverse event resulting from natural processes of the earth.

CAUSES

There are natural disasters such as a hurricane, a tornado, an earthquake and tsunami (a big surge of water in the ocean) that happen because of the weather and other natural conditions people can also cause disaster by causing an oil spill that pollutes the environment or starting a forest fire.

Natural disasters are caused due to some different reasons like:

-Soil erosion

-Ocean current

-Tectonic movements

-Seismic activity

-Air pressure

Natural activities taking place in the earth crust as well as surface are the main reasons for these disasters.

EFFECTS

-Explosions

-Hurricane

-Tornado

-Physical injury

-Earthquake

-Flooding

-Danger of death

-Emotional and health problems

-ground/surface water contamination

-Loss of home and possessions.

Natural disaster has the three general effects the primary effect; direct result of the disaster such as the collapsed buildings and water damage. the secondary effects; such as the result of primary effect and the tertiary effects.

EDAPHIC FACTOR, IT'S IMPACT ON BIOMASS, RICHNESS AND DISTRIBUTION OF SOIL ORGANISM

EDAPHIC FACTORS

This are the soil organisms that affect the diversity of organisms living in the soil environment these include soil structure, temperature, PH salinity. Some of them are influenced by man but most of them are influenced by man, but most are independent of human activity.

The whole range of soil conditions affecting the life of soil organisms are called edaphic factors. They are distinguished as a separate group of abiotic factors according to the importance of soil in terrestrial ecosystems. They are prerequisites for the existence of specific habitat conditions and, as a result of the specific composition of the community of the organisms that inhabit them.

Among the edaphic factors related to the soil we can distinguish:

Soil structure and type,

Soil temperature,

Soil moisture,

Soil pH and acidity,

Mineral salt content (salinity).

Soil structure includes the size, shape, and arrangement of particles such as sand, silt, and clay. It was shown that micro-grained soils usually contain higher amounts of microbial biomass than coarse-grained soils. It was found that the lighter soil structure favoured the development of bacteria. Researchers indicate that clay molecules and a higher number of micro pores in fine-grained soil limit the development of meso-fauna, which protects microorganisms from predation.

Soil PH and salinity the soil PH depends on the type of rock from which the soil was formed. Acid soils are formed from igneous rocks and sands. Alkaline soils are formed from carbonate rocks (e.g. limestone). In addition, the PH of the soil is influenced by climate, rock weathering, organic matter and human activity.

CONCLUSION

The most important abiotic factors influencing soil microorganisms are described in this review. Apart from the edaphic factors described above, the soil nutrient content in available forms, toxic compounds, light, and oxygenation can be distinguished. There are complex relationships between these factors since salinity affects the pH of the environment, temperature affects the water content of the soil, and both the presence of salt and humidity depending on the type of structure of the soil. The different taxonomic units of microorganisms are characterized by different ecological optimums. This is important from the point of view of agriculture, because human intervention in the soil environment may cause changes that will have a negative or positive impact on microorganisms.

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