**Chapter Three 3.**

**Living organisms and the environment**

**Introduction**

Individual, species, and populations both marine and terrestrial, tend to live in particular places. These places are called habitat. Each habitat is characterized by a specific set of environmental conditions- radiation light, temperature, moisture, wind fire frequency and intensity, gravity, salinity, currents, topography, soil, substrates, geomorphology, human disturbance, and so forth.

**A place to live: habitats**

Habitats come in all shapes and sizes, occupying the full sweep of geographical scales. They range from small (micro habitats), through medium (mesohabitats) and large (mega habitats). *Microhabitats* are few square centimeters to a few meters in area. They include leaves, the soil, lake bottoms, sandy beaches, talus slopes, walls, river banks and paths. A type in which debris piles up to a characteristic angle of repose.

*Meso-habitats* have areas up to about 10000 km2 which is the size of Cheshire, England. Each main meso-habitat is influenced by the same regional climate, by similar features of geomorphology and soils, and by a similar set of disturbance regimes.

Deciduous woodland caves, and streams are examples. Macro-habitats have area up to about one million km2 which is about the size of Ireland.

*Mega-habitats* are regions more than in million km2 extent. They include continents and the entire land surface of the Earth. Landscape ecologists, who have an express interest in the geographical dimension of ecosystems, recognize three level of ‘habitat’-region, landscape, and landscape element.

**Landscape elements**

Landscape elements are similar to micro-habitats, but a little larger. They are fairly uniform pieces of land, no smaller than about 10 m, which form the building blocks of landscapes and regions. They are also called *eco-topes*, *biotopes*, *geo-topes*, *faceis*, *sites*, *tesserae*, *landscape units*, *landscape cells*, and *landscape prisms*. These terms are roughly equivalent to landscape element, but have they own special meanings. Landscape elements are made up of individual trees, shrubs, herbs and small buildings. There are three basic kinds of landscape element-patches, corridors, and background matrixes.

1. Patches are fairly uniform (homogenous) areas that differ from their surroundings. Woods, fields, ponds, rock out crops, and houses are all patches

2. Corridors are strips of land that differ from the land to either side. They may interconnect to form networks. Road hedgerows and rivers are corridors.

3. Background matrixes are the background ecosystems or land use types in which patches and corridors are set. Examples are deciduous forest and areas of arable cultivation.

**Landscapes**

Landscape elements combine to form landscapes. A landscape is mosaic, an assortment of patches and corridors set in a matrix, no bigger than about 10000 km2 it is heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in similar form throughout.

**Regions**

Landscape combines to form regions, more than about 10000 km2 in area. They are collections of landscapes sharing the same microclimate.

**Habitat** **Specialists**

Habitat specialists have very precise living requirements. In southern England, the red ant, *Myrmica subuleti*, needs dry heath land with a warm south facing aspect that contains more than 50 percent grass species, and that has been disturbed within the previous decades. Other species are less pernickety and thrive over a wider range of environmental conditions. The three toed woodpecker (Picoides tridactylus) lives in abroad swath of cool temperate forest encircling the Northern Hemisphere.

**Habitat Generalists**

A generalist species is able to thrive in a wide variety of environmental conditions and can make use of a variety of different resources. A few species manage to eke out a living in a great array of environments. The human species (*Homo sapiens*) is the champion habitat generalist- the planet Earth is the human habitat. The plant kingdom, the broad-leaved plantain (*Plantago major*), typically a species of grassland habitats, is found almost everywhere except Antarctica and the dry parts of North Africa and the Middle East.

**3.1. Climatic Factors**

What are the climatic factors affecting the living organisms?

If you take a nice walk up a mountain there comes a point where it is too cold for broad leaf trees like the oak and you find yourself in coniferous forest. Don't be surprised to find that the animals are also affected by the climate. The climate also has an effect on the soil: if rainfall is high the soil may become waterlogged.

**Warm and wet climatic factors Radiation and light**

The sun is the primary source of radiation for the Earth. The visible portion (sunlight) is the effective bit for photosynthesis. It is also significant in heating the environment. Three aspects of solar radiation influence photosynthesis-the intensity, the quality, and the photo period (duration).

The intensity of solar radiation is the amount that falls on a given area in a unit of time. Watts per square meter or kilo-Jules per hectare are units of measurement. The average annual solar radiation on a horizontal ground surface ranges from about 800 KJ/Ha over a subtropical desert to less than 300 KJ/Ha in Polar Regions. Equatorial regions receive less radiation than the subtropics because they are cloudier a value of700KJ/Ha is tropical.

Quality of solar radiation is its wave length composition. This varies from place to place depending on the compositions of the atmosphere, different components of which filter out different type of the electromagnetic spectrum. In the tropics, about twice as much ultra-violate light reaches the ground above 2500M than at sea level.

Photoperiod is seasonal variations in the length of day and night. This is immensely important ecologically because day-length, or more usually night length, stimulates the time of daily and seasonal rhythms (breading, migration, flowering, and so on) in many organisms. Short day plants flower when day length is below critical level. Long day plants are flower when day length is above a critical level. The strawberry tree flowers in the autumn as the night length increases. Day neutral plants flower after a period of vegetative growth, irrespective of the photoperiod.

In the high Arctic, plant growth is telescoped into a brief few months of warmth and light. Positive heliotropism (growing towards the sun) is one way that plants can cope with limited light.

Temperature Broadly speaking annual temperatures are the highest at the equator and lowest at the poles. Temperature also decreases with increase elevation. The average annual temperature range is an important ecological factor. It is highest deep in high latitude continental interiors and lowest over oceans, especially tropical oceans. Many aspects of temperature affect organisms, including daily, monthly, and annual extreme and mean temperatures. Different aspects of temperature are relevant to different species and commonly vary with the time of year and the stage in an organism’s life cycle. It may also affect competition with other organisms and susceptibility to predation, parasitism, and disease when the limits of temperature tolerance are approached. Many flowering plants are especially sensitive to low temperatures between germination and seedling growth.

**Microorganisms and temperature**

Heat-loving microbes (thermophiles) reproduce or grow readily in temperatures over 45 0C. hyperthermophiles, such as sulfalobus, acidocaldarius, prefer temperature above 80 0C, and some thrive above 100 0C. The most resistant hyperthermophile discovered to date is phyrolobus fumarii, this microbes’ flourishes in the walls of ‘smokers’ in the deep-sea floor. It multiplies in temperature up to 113 0C.

Cold-loving microbes (psychrophiles) are common in Antarctic Sea ice. These communities include photosynthetic algae and diatoms, and a variety of bacteria. Polarmonas vacuolata, a bacterium, grows best at about 4 0C, and stops reproducing above 12 0C. Lichens can photosynthesize at 30 0C, providing that they are not covered with snow.

The redish-colored snow algae, chlamydomonas nivalis, lives on ice and snow fields in the polar and nival zones, giving the landscape a pink tinge during the summer months.

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