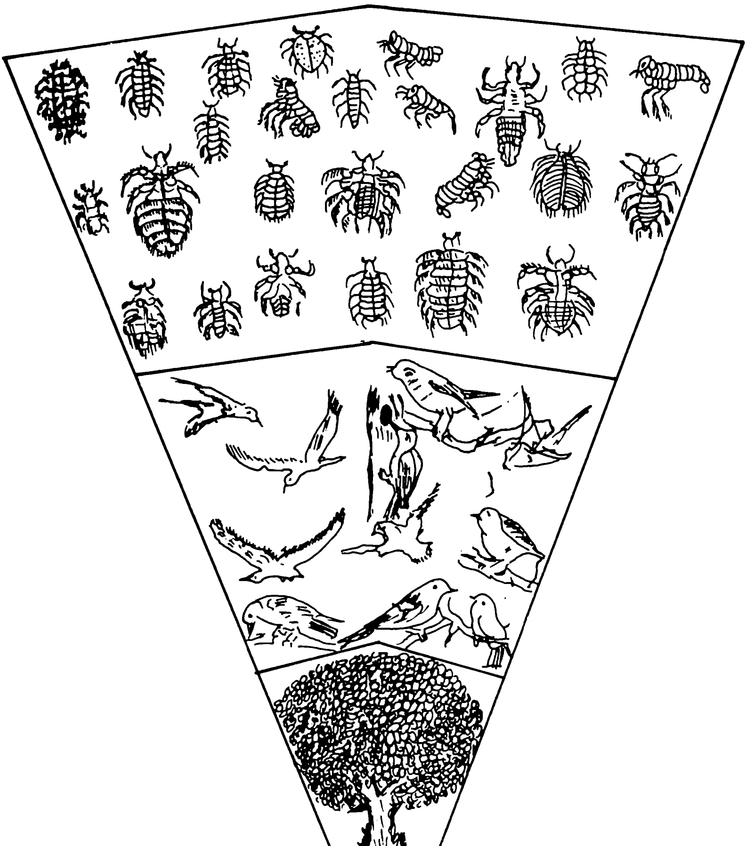

Fig. 2.3. Inverted pyramid of numbers in a tree-ecosystem.

fish that feed on them. The biomass of large carnivore fish feeding on small fishes is still higher. In English Channel, the biomass of primary producers is only 4 g/m^2 whereas that of the consumers is 21 g/m^2 (Harvey, 1950). In fact this is the case in most aquatic bodies. This can be explained if the time factor is also taken into account. The pyramid of energy explains this.

conditions including the humidity and wind velocity, the quantity and pattern of precipitation, etc. constitute the climate of any place. There are a number of causative agents that affect each of these factors.

1. THE LIGHT FACTOR

Light is a form of radiant energy. It is an essential factor for the primary production of plant materials upon which all other living organisms depend directly or indirectly.

The solar energy that sustains all life on the earth is received in the form of electromagnetic waves. These are of different wavelengths between 2900 Å to 50000 Å or 290 mμ to 5000 mμ. Å = Angstrom = 10^{-10} metres. 1 mμ = 10 Å or 1 nm or 1/1000000 mm (or 10^{-9} metres).

The visible or luminous range i.e. light is between 380 to 720 nanometres of wavelengths and the chloroplast pigments absorb radiations from 330 and 740 nm.

Light is a form of energy and hence it can be converted into other forms of energy such as heat. The quantity of light is usually expressed in terms of gram calories received in a unit area over a period of time such as g cal/m^2 year.

The intensity of brightness of light is measured in terms of candle power. The light intensity from a standard candle at one foot distance is called foot candle (F.C.) and at one metre distance a metre candle or lux. One F.C. is equal to 10.76 lux because as the light travels it spreads and its intensity decreases inversely to the square of distance travelled.

Effect of light on plants

Light affects and regulates plant life in a very large variety of ways. The most important role of light is in photosynthesis where the chlorophyllous tissues use light energy to build energy rich complex organic compounds from simple low energy inorganic substances. Light is abundantly received on the surface of earth and on an average approximately only 2 to 3 per cent of this solar energy is used in primary productivity. However, in deep shade under trees or under water, light becomes limiting below which phytosynthesis is not sufficient or effective for growth. *Compensation point* is that intensity are not well developed and growth remains best within a narrow difference of day and night temperature.

Effect of temperature on vegetation pattern and composition

The type of vegetation both in structure and composition is widely different in hot equatorial belt, warm tropics, relatively cool temperate and the permanently cold polar regions. The most striking difference in these geographical belts is the difference in their temperature besides light intensity, photoperiod and other ecological factors. The hot and humid equatorial and tropical regions are full of evergreen forests. These are extremely rich in variety of vegetation and different life forms of plants occupy the aerial space in several layers. In fact the tropical rain forests are the richest ones in diversity and density. A large variety of dicot trees, shrubs of all stature and size grow intermixed and adjusted compactly in limited space. The temperate belt has low temperature and the region is rich in forests of coniferous trees like pine and deodar and dicots like oaks, birches and chestnuts. Polar region has, on accouts of extreme cold condition, less free water available due to snow formation. The plants are dwarf and grow sparsely.

This effect of variation in temperature on vegetation with the same photoperiod is clearly evident in the Himalayas. The lower altitudes in the warm and humid Himalayas have rich growth of sal (*Shorea robusta*) trees with patches of *Dalbergia sissoo* (*Shishum*), *Eugenia* sp., etc. As the altitude increases temperature falls roughly at the rate of about 7°C per thousand metres. With the fall in temperature at altitudes above 1500 meters the temperate species like *Pinus roxburghii* and species of *Quercus incana* begin to appear. Further up, around 3000 metres *Pinus wallichiana, Cedrus deodara* and *Abies pindrow* become dominant. The tree height gradually decreases in temperate belts. Above 4000 metres the growth is almost negligible. Shrubs like *Rhododendrons,* grasses and several dicot herbs like *Saxifraga, Primula* and *Anemone* replace trees. At about 5600 metres altitude the temperature falls below freezing point all the year round. Under such a snow covered habitat only some highly specialized algae, some lichens and mosses grow for a short period. Higher altitudes are devoid of vegetation.

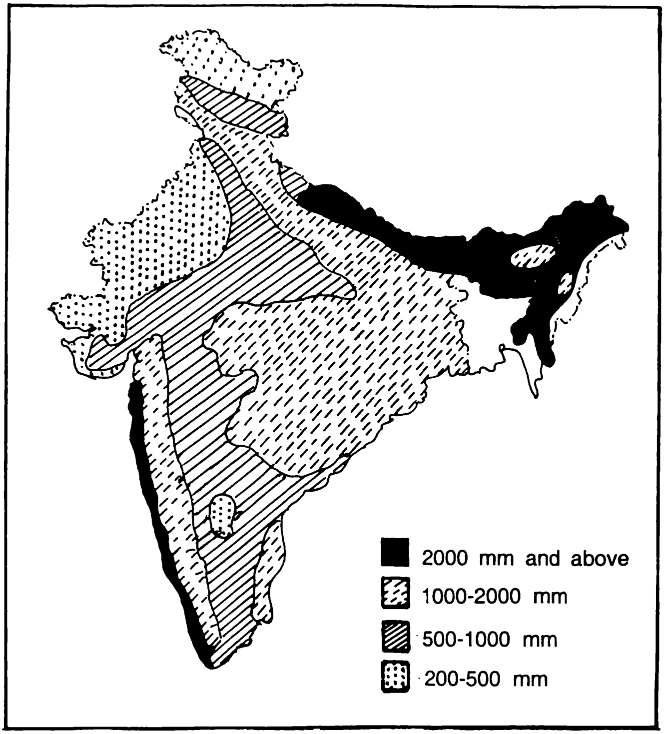

Fig. 4.2. Map showing range of rainfall in different parts of India.

lifting soil particles into the air. Lighter or smaller particles are raised highest in each beating and as such the finer particles are selectively deposited on the surface. The clay particles closely fit in the pore space and check water percolation. This results in horizontal movement of water in form of run off resulting in loss of the effective rainfall. The vegetation intercepts the beating effect of rainfall and thus water is gradually soaked in soil where from plants use it over a long period.

The degree of slope is another factor for water loss. On hill slopes the soil is artificially cut and prepared into small flat plots one over the other like steps of stairs for the purpose of agriculture. This retards flow rate of water and provides opportunity for the water to percolate down. Soil erosion is also checked. This type of practice is called *terrace* cropping.