Section B and C

Volume-18

Contents

10. ECOLOGICAL PRINCIPLES

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H. BIOGEOGRAPHY

(Distribution of Animals and Plants)

No organism occurs in uniform numbers throughout the world. Rather, specific organisms are restricted to specific communities or groups of communities. Three aspects of the distribution of an organism are generally recognized: geographic range, or the specific extent of land or water area where the organism normally occurs; the geologic range, or the distribution in time, past and present; and the ecological distribution, or the major biotic communities (i.e., marine biome, freshwater biome and terrestrial biome) of which the organism is a member. Certain biologists have also made distinction between geographic distribution (horizontal or superficial distribution) and bathymetric distribution (vertical or altitudinal distribution0. Bathymetric distribution includes the following three realms: (i) Halobiotic, or vertical distribution of organisms in marine (sea) habitat, (ii) Limnobiotic, or vertical distribution of organisms in freshwater habitat; and (iii) Geobiotic or altitudinal distribution of organisms on land. All the living organisms in a given region are termed the biota of that region. The animals of a given region are collectively termed the fauna, and the plants, of a given region, the flora (i.e. fauna + flora = biota). Here, a distinction can be made between the following two terms flora and vegetation. Flora mainly refers to the botanical composition of a place, i.e., the names of different plant species, while vegetation means the totality of forms in which the emphasis is not on names of different plant but their life forms, number and coverage. The studies of the distribution of biota are collectively called biogeography; of animals only, zoogeography; and of plants only, plant geography or phytogeography. There are two major approaches to the study of biogeography or geographical ecology:

(i) Descriptive or static biogeography which deals with the description of biota of different botanical and zoological areas of earth; and

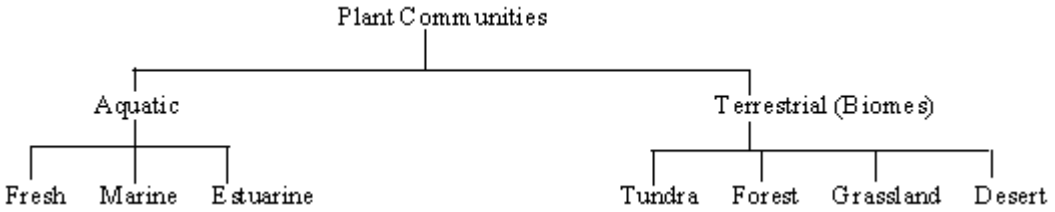
(ii) Interpretative or dynamic biogeography which describes the forces which have brought about plant and animal distribution.

DESCRIPTIVE PHYTOGEOGRAPHY

With a descriptive approach of phytogeography, will be discussed the major plant communities of the world, and different vegetational belts of the earth constituted by these biomes together with characteristic climatic conditions of the area.

1. **Major Plant Communities (Biomes) of the world**

As already discussed in sufficient details major plant communities of the world are classified chiefly on the basis of the kinds of habitat and environmental conditions into the following chief types:



2. Phytogeographical Regions of World (or Chief Vegetational Belt of the Earth)

On the basis of climatic and geographical conditions, the earth is usually divided into the following four broad vegetational belts:

A. Arctic zone. This zone is divided into the following tow types:

(1) Arctic proper. This zone occurs around the North Pole and remains covered with ice throughout the year. This zone in fact is Tundra biome and its chief components of vegetation include some algae, annual flowering plants, mosses and lichens.

(2) Subarctic. This is a less defined zone which extends from southern arctic to the northern limits of temperate zone. This region is very cold, contains abundant bogs and has vegetation including small height trees, shrubs and herbs in the months of June and July. Ground vegetation often includes some pteridophytes, orchids, insectivorous plants, mosses and lichens.

B. North Temperate Zone. This zone extends between 30^0N latitude and 55^0N latitude and includes following two major zones:

1. North temperate of the eastern zone. This zone is further subdivided into the following four zones:

(i) **Western and central Europe.** This zone is demarcated in north by the subarctics and in south by the Alps and British Islands. It is forests are dominated by several gymnospermous tall trees such as Pinus, Picea and Abies, and Angiospermous trees such as oaks, maple and chestnuts. Ground vegetation comprises orchids, wild roses, buttercups, Viola, Salvia, Dianthus, etc. At high altitudes of this zone trees are replaced by grassy vegetation with some herbaceous flowering plants.

(ii) **Mediterranean.** This zone extends between 30^oN and 40^oN latitudes, south of mountain ranges in Europe and in Asia around Mediterranean sea and is characterized by warm temperate type climate. Vegetation is chief composed of fruit trees, olives, nut trees, oranges, and also some foreign palms, cacti, acacias, etc. In the Asian region of Mediterranean as in Arab countries, rainfall is low, deserts are common and sparse vegetation includes following species *Atriplex*, *Alhagi Polygonum* and *Phoenix dactylifera*.

(iii) **Northern Africa.** This zone includes the northern parts of morocco, Algeria, Libya and Egypt. It is characterized by scanty rainfall and sparse vegetation. In order areas (i.e. mountains) some conifers and broad-leaved oaks are common. In deserts (including some portion of Sahara desert) some herbs, shrubs, woody acacias and succulent xerophytes occur.

(iv) **Himalayas, eastern Asia and Japan.** Tibet, China and Japan have different type of vegetation. In China and Japan conifers such as *Cryptomria, Sciadopitys, Cephalotaxus*, *Ginkgo biloba* and Cycas and angiosperms such as Rhododendrons, *Cinnamomum camphora* and Begonia are common. The vegetation of Himalayas will be described later in this chapter.

2. North temperate of the western Hemisphere. It includes the parts of United States and Canada lying mostly between north latitudes 30^0 to 55^0. The eastern coastal regions of these countries in the temperate belt have some very characteristic plant species such as tropical fern (*Schizaea pusilla*). The forest communities are composed of conifers and deciduous trees. On lower altitudes some wild cherries, plums, roses and orchids are abundant. Forests of conifers are common in southern parts and on western parts of Rocky mountains of USA. In north California grows *Sequoia sempervirens*, the tallest tree of world. Ground vegetation is composed of *Salicornia herbacea, Rumex maritima, Monotropa uniflora, Saxifragea* types of xerophytic plants.

C. Tropical zone.

This zone is divided into two subzones:

(A) Palaetropic. It comprises old world or eastern tropics and has the following two botanical regions:

(1) Tropical Africa. This is a large-sized landmass of varied topography. It includes high altitudes and Sahara deserts which have little of no rainfall. In Africa, most remarkable plant is *Welwitschia mirabilis*, Eastern part of Central Africa has India-like vegetation of *Borassus flabelliformis, Tamarindus indica, Ficus, Aspargus, Clematis, Phaseolus, Cassia fistula, Erythrina, Acacia, Albizzia, Zizyphus, Bauhinia*, etc.

(2) Tropical Asia. It includes Arabia, Pakistan, India, Burma, Ceylon, Thailand, Indonesia, Philippines and Islands of Indian seas. In Arabia, the rainfall is low and most of the desert species are found, *Coffea arabica* is a native plant of Arabia. Ceylon is rich in species diversity and ferns are the chief components of its sparse natural vegetation. Malaya, Java and Sumatra are characterized by heavy rainfall and their vegetation comprises varied types of palms, some types of ferns, tall trees, lianas and insectivorous plants. Some important plants of Java are *Albizzia, Pterocarpus, Tamarindus, Bombax, Cassia, Dendrocalamus*, etc. the common trees of Bunma and Thailand are jack fruit, orange, mango, banana, betel nut, etc.

(B) Neotropics. It comprises Mexico and major part of South America. The low rainfall areas of Mexico are rich in xerophytes. At higher cooler altitudes there is a forest of conifers such as *Pinus, Soaruce, Quercus and Populus*. On mountain peaks grasses are most common. In wet areas of Mexico, there are mosses, palms, bamboos, orchids, etc. in South America, there are extensive forests of flood-resistant trees such as *Bertholletia excelsa, Maximiliana regia* and also mangrove vegetation. There are also found many epiphytes.

D. South Temperate Zone

This zone includes extreme southern region of Africa, Australia and New Zealand. In African Area, the vegetation is chiefly made up of ferns and gymnosperms. On the hills conifers are present. Its lower wet regions contain *Salix* and *Phragmites* and dry regions have grasses such as *Andropogon* and tress such as *Acacia*. The vegetation of northern part of Australia is similar to that of south East Asia and includes trees of palms, nuts, *Eucalyptus*, *Acacia* and *Casuarina*. Some petridophytes are also found in the ground vegetation. In the South Australia Araucarias are common. New Zealand forests are mostly made up of conifers together with ferns, palm such as *Rhopalostylis*, many species for *Metrosideros*. New Zealand has richest Bryophytic flora.

3. Phytogeography of India

Indian subcontinent lying between 80^{o} and 37^{o}N, and 68^{o} and 97^{o}E has its own peculiar physiographic, climatic and biotic features. It is surrounded on its south, east and west by oceans and in the north by mountainous chains highest in the world. The subcontinent stretches out between tropical and subtropical belts. Its climate is chiefly modified by oceans and mountains. In the south and in the Far East the climate is typically tropical, while it is temperate in the north, and highly arid in the northwest. The general climate of India is of monsoon type.

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