

ECOLOGY: TYPES AND IMPORTANCE

Ecology is defined as the branch of science that studies the relationships between organism, their habitat and all the living and non-living factors involved in those habitats.

The scientist Reiter was the first person to use the word 'Ecology'. The term ecology was coined by combining two Greek words, oikos meaning 'house' or 'dwelling place' and logos meaning 'the study of' to denote such relationships between the organisms and with their environment. Although, there is uncertainty about the original coining of the term, however many biologists grant credit to the German zoologist Ernst Haeckel, who used the term as 'oekologie' in 1866 to refer the inter-relationships of living organisms and their environment. Many scientists defined the ecology in different ways such as:

Allee *et al.* (1949) considered ecology as "the science of interrelation between living organisms and their environment, including both the physical and biotic environments and emphasizing inter-species as well as intra-species relations".

Eugene Odum (1963) is, known as the father of modern ecology. According to him ecology is the structure and function of ecosystems.

Lewis and Taylor (1967) have defined ecology as "the study of the way in which individual organisms, populations of some species and communities of populations respond to these changes".

Smith (1977) prefers to consider ecology as "a multidisciplinary science which deals with the organisms and its place to live and which focuses on the ecosystem".

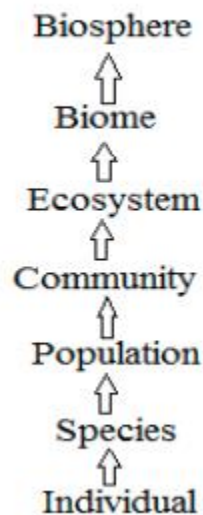
In simple terms ecology is the branch of biology that deals with scientific study of the interactions among organisms and their environment. The environment is made up of both living organisms (biotic) and physical (abiotic) components. Organisms and their environments are closely linked and dependent on one another. Any changes in the environment have an impact on living organisms, and vice versa. The main aim of ecology is to understand the distribution of biotic and abiotic factors of living thing in the environment. Ecology is a vast and encyclopedic biological subject. It is studied at various levels, such as the main levels of study in ecology are

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the Biosphere, ecosystem, community, population, and organism. It refers to any form of biodiversity. The study of ecology is closely related to the fields of physiology, genetics, evolution, and behavior. An example of ecology is studying the food chain in a wetlands region.

The interaction of organisms with their environment leads to the formation of group of organisms called ecological hierarchy or ecological levels of organization. It means the ranking of the ecological members. Every species existing in the universe makes the ecology. The basic unit of an ecological system is an individual organism. The different hierarchies of ecological systems are presented below:

Hierarchy of Ecology



The levels of ecological study offer different insights into how organisms interact with each other and the environment. The study of ecology is divided into two major subdivisions:

(i) Autecology, (ii) Synecology

1. Autecology: It deals with the ecology of individual species and its population including the effect of other organisms and environmental conditions on every stage of life cycle. In other words, it is a study of inter-relationship between individual species or its population and its environment.

2. Synecology: The branch of ecology that studies about the relationship of various groups of organisms to their common environment. It deals with the plant communities their composition, behavior and relation to the environment.

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Autecology helps to understand the relationships between a particular organisms and environment and synecology helps to understand the relationships between communities and environment. For example, if the study is to be carried out about the study of any tree with the environment than it is known to be autecology. If we study effect of forest on environment, then it is said to be synecology.

In the words of Herreid II (1977) “the two types of study, autecology and synecology, interrelate, the synecologist painting with a broad brush the outline of the picture and autecologist stroking in the finer details”.

TYPES OF ECOLOGY

Ecological studies are either organism-based or habitat-based and are conducted at different levels. Autecology and synecology are two main branches of ecology. Besides these major ecological subdivisions, different branches were created to explain different specific and detailed aspects of ecology. There are specialized branches of ecology as follows:

1. Organism level: Organism-level ecology is concerned with the adaptations that allow individuals to live in particular habitats. These adaptations can be morphological, physiological, and behavioural.

(i). Autecology: Autecology, also called species ecology, the study of the interactions of an individual organism or a single species with the living and non living factors of its environment.

(ii). Population Ecology: It is the study of the processes that affect the distribution and abundance of animal and plant population.

(iii). Community Ecology: Community ecology, study of the organization and functioning of communities, which are assemblages of interacting populations of the species living within a particular area or habitat.

2. Based on Habitat or Ecosm or Ecosystem level:

(A)Terrestrial Ecosystems

(i). Forest ecology: Forest ecology is the scientific study of the interrelated patterns, processes, flora, fauna and ecosystems in forests.

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(ii). Grassland ecology: Grassland ecology is the study of all aspects of the ecology of grasslands, which are regions dominated by grass species but containing other non-woody plants.

(iii). Desert ecology: Desert ecology is the study of interactions between both biotic and abiotic components of desert environment.

(iv). Wetland or marsh ecology: A wetland is a low-lying land area that is saturated with water, either permanently or seasonally, and contains hydric soils and aquatic vegetation.

(B) Aquatic Ecosystems

(i). Marine ecology: It is the scientific study of living things in the ocean and how they interact with their environment.

(ii). Lagoon ecology: Lagoon is defined as a shallow body of water separated from the ocean or from larger bodies of water by a reef or other barrier.

(iii). Fresh water ecology or Limnology: Limnology is the study of inland waters, both lotic waters (running water bodies), such as rivers, streams and lentic waters (standing water bodies), like lake, ponds etc.

3. Applied Ecology: Applied ecology is an integrated treatment of the ecological, social, and biotechnological aspects of natural resource conservation and management. It includes the following:

(i). Agricultural ecology: Agricultural ecology is the study of agricultural ecosystems and their components as they function within themselves and in the context of the landscapes that contain them.

(ii). Phytosociology: The branch of plant ecology concerned with the composition, distribution, characteristics, and interrelationships of plant species in plant communities.

(iii). Paleoecology: The study of the relationships between organism and their environment, and the way organisms functioned in physical and biological interaction, within the geologic past.

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(iv). Conservation ecology: It deals with the application of ecological principles for proper management of resources leading to high and sustained yield of useful biological material for human welfares.

(vii). System ecology: It deals within the structure and function of ecosystem by means of applied mathematics, mathematical models, and computer programs. It concentrates on input and output analysis and has stimulated the development of applied ecology-the application of ecological principles to the management of natural resources, agricultural production, and problems of environmental pollution.

(x). Ecophysiology: It is the study of how the environment, both physical and biological, interacts with the physiology of an organism. It includes the effects of climate and nutrients on physiological processes in both plants and animals, and has a particular focus on how physiological processes scale with organism size.

IMPORTANCE OF ECOLOGY

The study of ecological principles provides a background for understanding the fundamental relationships of the natural community and also the sciences dealing with particular environment such as soil, ocean, forest and inland waters. Many practical applications of this subject are found in forestry, agriculture, horticulture, fisheries, biology etc. The science of plant ecology deals with the scientific study of relationships of plants and their environment and describes the home life plants. It brings out the physiological relationships between plant and their environmental conditions. Science ecological principles are the basis of practice in agriculture and forestry. Ecological is crucial for human wellbeing and prosperity. It provides new knowledge of the interdependence between organisms with their natural environment that is essential for food production, ensuring resources like land and water, and sustaining biodiversity in a changing climate. Ecology is the basis of nature conservation. The following reasons explain the importance of ecology.

1. Helps in conservation of environment: The study of ecology allows us to understand the negative impact of human behavior on the environment. By first identifying the primary means by which the problems we experience in our environment begin, we can help guide conservation efforts. By following this identification process, we show where our efforts will have the greatest impact. Environmental conservation means protecting the planet, conserving its natural resources and improving the quality of life for all living things.

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2. Proper Resource allocation: Resource allocation is the process of planning, managing, and allocating resources within ecological knowledge. We can know the resources necessary for the survival of various organisms. Ecology provides the basis for developing good conservation policies. Especially when those to whom natural resources are entrusted possess ecological knowledge in areas such as forestry, wildlife, agriculture, land management and fisheries.

3. Enhances energy conservation: Conserving energy means reducing energy use by adapting human behavior and habits. All living things require energy for growth and development. Lack of ecological understanding leads to overexploitation of energy resources such as food, light and radiation, resulting in their depletion. Proper knowledge of ecological requirements prevents unnecessary waste of energy resources and saves energy for future purposes.

4. Eco-Friendliness: The term most commonly refers to products that contribute to green living, or practices that help conserve resources such as energy and prevent air, water, and noise pollution. Ecology promotes harmonious life within the species and the adoption of a lifestyle that protects the ecology of life.

5. Aids in disease and pest: Pests and diseases are a natural part of ecosystems. Many diseases are spread by vectors. Ecological research provides the world with new ways to understand how vectors and pests behave, and provides people with the knowledge and techniques to deal with pests and diseases.