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GENERAL BIOLOGY

New Definitions of the Concepts and Terms Ecosystem and Biogeocenosis

S. A. Ostroumov

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The terms ecosystem and biogeocenosis were coined by Tansley in 1935 [1] and by Sukachev in the 1940s [2], respectively. These terms are widely used in biological research [3–10], and there are several definitions of the term ecosystem [4–8]. However, a large body of new biological information has been accumulated since the time of introduction of these terms. Therefore, a revision of the currently accepted concepts of natural objects and interpretation of basic ecological terms (e.g., ecosystem and biogeocenosis) may be proposed. It seems reasonable to continue the search for new variants of definitions of these terms.

The goal of this work was to contribute to this search by suggesting and substantiating specific definitions of two basic ecological terms. I certainly realize that this problem is very complex and its exhaustive solution is practically unattainable, because it is impossible to find an ideal definition that would be adequate to all imaginable situations or satisfy all experts. Nevertheless, it is worth trying to propose modern variants of refined definitions capable of taking into account large volumes of new information concerning aquatic [6, 11–15] and terrestrial [7, 9, 10, 14] ecosystems.

Sometimes, the terms used in the definition require additional explanation themselves (e.g., trophic structure, biocenosis, community, etc.) [3]. For example, according to a typical definition, ecosystem is a biological community together with its physical environment (see p. 679 in [5]). However, this definition by no means reflects the whole body of experimental findings and theoretical concepts accumulated in ecology during the past decades. Given the remarks made above in this work, the following variant of definition can be suggested:

Ecosystem is the complex of interconnected living organisms inhabiting particular area or unit of space, together with their environment and all their interrelationships and relationships with the environment. Ecosystem is characterized by the description of populations (abundance) of individual species; interspecies relationships; activity of organisms; physical and chemical characteristics of environment; flows of matter, energy, and information; and description of changes of these parameters with time.

This definition does not contain terms such as trophic structure, trophic levels, biocenosis, biotope, community, components, systems, and succession. Because this definition is applicable to both aquatic and terrestrial ecosystems, as well as to natural or model systems of various ranges and degrees of complexity, it seems to be quite universal. Specific features of this definition and their substantiation are briefly summarized in Table 1.

The term biogeocenosis, suggested in the early 1940s by Sukachev [2], has gained wide recognition [7, 8]. This term is widely used in ecological research. The classical definition given by Sukachev is cited in many manuals and textbooks. However, a large body of new ecological information accumulated since the time of introduction of the term makes it reasonable to consider new variants of the definition. These definitions should take into account both recent progress in biological research and specific features of the current practice of the use of this term. For example, many researchers apply this term to aquatic ecosystems. To be applicable to aquatic ecosystems, the original definition of this term should be revised. According to the modern taxonomic system, fungi are excluded from the plant kingdom. New findings show that the information flow plays a significant role in the organization of superorganism structures [9, 14]. Based on a modified definition of V.N. Sukachev, the following definition of biogeocenosis can be suggested:

Biogeocenosis is an aggregate of natural components (atmosphere, rocks, plants, animals, representatives of microorganisms and fungi, soil and hydrological conditions, and bottom sediments in the case of aquatic systems) in a particular area of land or water. Biogeocenosis is characterized by specific relationships between components; specific types of matter, energy, and information flows providing a certain degree of integrity (unity of components, indivisibility)

Moscow State University, Vorob'evy gory, Moscow, 119899 Russia

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