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PALEOECOLOGY:

Paleoecology is the ecology of the past. It is mainly concerned with reconstructing past biota, populations, communities, landscapes, environments, and ecosystems from available geological and biological (fossil) evidence. There are two major types of paleoecology: Quaternary paleoecology, concerned with the last 2.8 million years of Earth’s history, and deep-time paleoecology, based on fossils from pre-Quaternary sediments over a wide range of timescales. The major philosophical concepts in paleoecology are simplicity, the method of multiple working hypotheses, and methodological uniformitarianism. There is a wide range of types of paleoecological evidence, including individual fossils, assemblages of fossils, sediment inorganic and organic geochemistry, isotopic composition of fossils and sediments, and sediment lithology. There are nine main stages in Quaternary paleoecological studies. Interpretation of paleoecological data primarily concerns paleoecological reconstructions and ecological explanations for observed changes. There are many examples of Quaternary paleoecological contributions to our understanding of ecological systems. Exciting future developments in paleoecology are likely to occur as a result of major advances in Earth sciences and in the reconstruction of past environments from nonbiological evidence.

Classic paleoecology uses data from fossils and subfossils to reconstruct the ecosystems of the past. It involves the study of fossil organisms and their associated remains (such as shells, teeth, pollen, and seeds), which can help in the interpretation of their life cycle, living interactions, natural environment, communities, and manner of death and burial. Such interpretations aid the reconstruction of past environments (i.e., paleoenvironments). Paleoecologist have studied the fossil record to try to clarify the relationship animals have to their environment, in part to help understand the current state of biodiversity. They have identified close links between vertebrate taxonomic and ecological diversity, that is, between the diversity of animals and the niches they occupy.[1] Classical paleoecology is a primarily reductionist approach: scientists conduct detailed analysis of relatively small groups of organisms within shorter geologic timeframes.

Evolutionary paleoecology uses data from fossils and other evidence to examine how organisms and their environments change throughout time. Evolutionary paleoecologist take the holistic approach of looking at both organism and environmental change, accounting for physical and chemical changes in the atmosphere, lithosphere and hydrosphere across time. By studying patterns of evolution and extinction in the context of environmental change, evolutionary paleoecologist are able to examine concepts of vulnerability and resilience in species and environments.

Community paleoecology uses statistical analysis to examine the composition and distribution of groups of plants or animals. By quantifying how plants or animals are associated, community paleoecologist are able to investigate the structures of ancient communities of organisms. Advances in technology have helped propel the field, through the use of physical models and computer-based analysis.