

Plant-insect interactions in deep time

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Abstract:

Fossil evidence of insect herbivory dates back to the early Devonian, and all of the fundamental feeding strategies of herbivorous insects, except leaf mining, were established by the Late Carboniferous. Over the last 400 million years, trophic complexity (the relationship between the number of species and the density of trophic interactions) and insect feeding diversity (the number of distinct ways in which insects consume plants) have increased. Today, food webs incorporating plants, phytophagous insects, and carnivorous insects account for up to 75% of non-microbial global terrestrial biodiversity. Thus, plant-insect interactions affect practically all terrestrial life. Paleobiological studies of insect damage on fossil plants can provide valuable information about insect diversity, ecological interactions, and evolutionary adaptation.

For example, the Paleozoic–Mesozoic transition is characterized not only by the most massive Phanerozoic mass extinction at the end of Permian, but also extensive aftermath and a prolonged period of major biotal recovery during the succeeding Middle to Late Triassic. This delayed recovery is generally attributed to the effects of extreme environmental conditions inflicted on Early Triassic ecosystems.

Studies of insect damage on plants are often the only way to learn about how insect diversity and ecological associations respond to environmental changes. Both paleobiological and ecological studies provide valuable information on how insects might have been affected.

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