35. Soil Macrofauna

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The soil macrofauna (essentially those soil invertebrates that can easily be distinguished with the naked eye; in this case excluding the beetles) represent the most diverse biological element in the soil fauna. The macrofauna contains a number of the ecologically most important groups in soils. A number of these groups (for example the termites, ants and earthworms) have been described as 'ecosystem engineers' due to the profound effect they have on the whole biological matrix that they inhabit. Sadly, when compared with more directly economically important herbivorous above-ground invertebrates, the below-ground macrofauna is poorly known both taxonomically and functionally. However, in principle, the group is moderately taxonomically tractable using classical techniques. The size of the task still remains daunting, though, especially as a complete systematic treatment would require systematists with a wide range of taxonomic expertise. This requirement of such taxonomic breadth is especially worrying in the context of a steady decline in the global taxonomic workforce and knowledge base. In this talk these problem areas are discussed, especially in the light of modern advances in systematic techniques. Will these techniques, especially molecular ones, help to overcome the ever narrowing taxonomic bottleneck?

36. Soil beetles

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Beetles (Coleoptera) and their larvae are one of the major groups of the soil fauna in terms of biomass and species richness. They are the most speciose insect order with about 400,000 described and probably many more undescribed species, a good proportion of which uses the soil habitat during at least one period of their life cycle. Because of the high number of species and poor taxonomic knowledge of many soil living groups, they make great demands on sorting and identification. The long tradition of pitfall trapping in ecological field studies presumably caused the common view that the most important soil beetles are Carabidae, Staphylinidae, Scarabaeidae, Elateridae and Tenebrionidae, most of which are relatively well known. However, leaf litter and soil studies in temperate and tropical regions, using mainly the Winkler method, revealed that, as well as those families Histeridae, Ptiliidae, Leiodidae, Scydmaenidae, Pselaphinae, Mycetophagidae, Curculionidae (incl. Scolytinae) and, especially in grassland habitats, the larvae of Scarabaeidae and Elateridae may form a major part of the soil and litter beetle fauna. These taxa represent different functional groups: fungivores (Ptiliidae, Leiodidae, Staphylinidae, Mycetophagidae), saprophages (Ptiliidae, Leiodidae, Staphylinidae, Scarabaeidae), herbivores (Scarabaeidae, Elateridae, Curculionidae), xylophages (Curculionidae, Scolytinae), xylomycetophages (Scolytinae) and predators (Histeridae, Scydmaenidae, Staphylinidae, Pselaphinae). A general assignment to a functional group at family level
is not possible. Ptiiidae, Pselaphinae, Scolytinae, larvae in general and some groups of Histeridae, Staphylinidae and Curculionidae are not amenable to easy and accurate sorting without taxonomic advice. The taxonomic and systematic knowledge of these groups is generally poor apart from the fauna of temperate regions.

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37. Pollen and the systematics of the Caesalpinioideae (Leguminosae)

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A pollen morphological survey was carried out on subfamily Caesalpinioideae to provide a palynological dataset for phylogenetic study. Pollen of 860 samples, representing 157 genera and 803 species, has been examined using LM, SEM and TEM. The Caesalpinioideae comprises 161 genera and about 1340 species in total. Twenty-two characters have been delimited, and in the presentation areas of congruence between palynological and molecular datasets of the Caesalpinioideae will be highlighted. Palynological characters include: aperture structure and membrane surface type; wall structure, including presence of foot layer, extra infratectal or columnar layers, supratectal structures, and type of infratectum; variation of surface ornamentation between mesocolpial areas and aperture margins, and presence or absence of free standing bacules or granules within lumina. Systematic and functional significance of these structures will be discussed.

38. Dating Nodes In A Phylogenetic Tree Of The Betulaceae: Insight From Non-Coding Ribosomal DNAs

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We present a phylogenetic analysis of the Betulaceae including at least one species of each subgeneric division (26 taxa). Betulaceae is comprised of six genera (Betula, Alnus, Carpinus, Corylus, Ostrya, Ostryopsis) distributed in the northern Hemisphere. Parsimony analyses based on ribosomal DNA sequences of 55 gene spacers and ITS supported the monophyly of the subfamilies and all genera except Carpinus. Likelihood ratio tests showed rate heterogeneity across lineages, therefore we made the phylogenetic trees ultra-metric by transforming maximum likelihood branch lengths (HKY85 + gamma model of DNA evolution) using the non-parametric rate smoothing method of Sanderson. Error estimates were obtained for each noncoding DNA region by repeating the procedure on 100 bootstrapped matrices. Calibration was then performed with the aid of the extensive fossil record of the family with both fossils from extant and extinct genera such as Paleocarpinus and Cranea. When Paleocarpinus lacinata was used a calibration point at the root node of subfamily Coryloideae, the root node of Betulaceae was set at 67 My., and at 58 My. for subfamily Betuloideae.