VIII. PALYNOLOGICAL EVIDENCE ON THE HISTORY OF PANTROPICAL PLANTS

In a recent paper by Germeraad, Hopping and Muller (1968) a stratigraphical zonation for tropical Tertiary sediments is developed, based on the distribution in time and space of fossil pollen grains and spores. Data were derived from large scale samples of coastal oil-well samples in E. South America (Columbia, Venezuela, Trinidad), W. Africa (Nigeria), and Malesia (NW. Borneo). This study was made for the prosaic purpose of providing the necessary geological information for oil exploration and it is remarkable that such academic subjects as the migrations and extinctions which have taken place in the ancient plant world thus suddenly become of interest for oil-companies. It will be clear that such a large scale effort has yielded many data of interest to botanists and these are summarized in a paragraph on "Botanical results". Here those fossil pollen and spore species of which the botanical affinities are well established, are discussed with special emphasis on phytogeographical aspects. In this review a few selected examples will be briefly cited.

The first group concerns still living pantropical genera:
Alchornea (Euphorbiaceae) has at present a pantropical distribution and this was the case already for the major part of the Tertiary. The typical pollen grains of this genus first appear in the Eocene.
Rhizophoraceae are represented in the fossil record by the Rhizophora pollen type, which also may include pollen of Bruguiera and Ceriops. This group also appears first in the Eocene, but in W. Africa it has not been found before the Miocene, which suggests later immigration in this area. Acanthaceous pollen is found only from the Miocene upwards, which raises the question whether the present day pantropical distribution of these genera may be of relatively recent origin.
Remarkable is also the case of Ceratopteris (Parkeriaceae). The typical spores of this fresh water fern first appear at base Oligocene in all areas investigated and then remain fairly frequent. This phytogeographical event forms the base of one of the major palyno-stratigraphical zones in tropical Tertiary sediments. It suddenly appears and cannot be linked with some supposed ancestral type.
These examples deal with taxa which at present have a pantropical distribution.

A second group is represented by Nypa (Palmae) and Ctenolophon (Linaceae) which are shown to have had a much wider distribution in the early Tertiary than at present. Nypa pollen is found already in the Upper Cretaceous of Borneo, W. Africa and Northern South America. The reduction in area occurred in mid-Tertiary times.

A third group of interest is formed by a few pollen types, the distribution of which is indicative of tropical transatlantic contacts.

Crenea (Lythraceae) appears to have crossed the Atlantic from West to East in the Oligo-Miocene, only to get extinct in W. Africa in the Pliocene. The pollen of the genus Symphonia (Guttiferae) on the other hand is found earlier in Nigeria than in South America and this suggests crossing from East to West approximately in the Oligo-Miocene.

However, these are two exceptional cases and the pollen record from tropical South America and Africa clearly indicates that, at least in the Tertiary, the flora on each side of the Atlantic was developing on its own towards the present day widely differing flora.

Pollen of Gramineae (onwards of the Eocene) and Compositae (only upwards from the Miocene) is also well represented in the tropical Tertiary record, but since it is difficult to identify taxa of lower rank in these groups, phytogeographical conclusions are correspondingly more vague.

As an example of a group which probably always had a restricted distribution the fossil record of Sonneratia (Sonneratiaceae) from NW. Borneo is discussed. The earliest pollen type comparable to S. caseolaris dates from the Lower Miocene. S. alba pollen enters the record later, in the Upper Miocene. An earlier ancestral pollen type, which shows affinities with Lythraceae is also described.

These examples show that information on fossil pollen grains and spores provides estimates on minimum age, origin, and migration, and thus of time actually available for dispersal of plant taxa. These estimates, however approximate, remove at least some uncertainty from the plant geographer's deductions. Since this paper releases only a small amount of information from the vast richness of the tropical fossil pollen record, it is to be expected that continued research will yield much more invaluable information. A prerequisite is however, that the palynological study of the recent flora is moving ahead at an accelerating pace and that this knowledge is communicated to and critically applied by the stratigraphical palynologist.

Reference:

Germeraad,J.H., Hopping,C.A. & Muller,J.: Palynology of Tertiary sediments from tropical areas (Review of Palaeobotany and Palynology 6, 1968, 189-348).

J. Muller.