

*Anne Weidich*

## Comments and Suggestions towards various interpretations of the Postglacial elm decline

by

VISHNU-MITRE

Birbal Sahni Institute of Palaeobotany, Lucknow.

After 1941, when IVERSEN first demonstrated the evidences of Farmer Culture in the Danish Postglacial pollen diagrams, the pollen-analytical studies of prehistoric Man's influence on vegetation carried out in many parts of Europe, have amply substantiated IVERSEN's hypothesis. Even outside Europe evidences on similar lines have been obtained suggesting the introduction of Agriculture by clearance of forest. Though in outline the hypothesis is hardly disputed but in the precise interpretation of the facts, the opinion remains divided. The credit largely goes to the Danish workers for not only the origin of the concept but also for the two diverse schools of thought, which, however, seem to show increasing agreement (IVERSEN 1960; TROELS-SMITH 1960).

It is now largely being realised that the understanding of the Postglacial forest development is far from easy since, besides the other factors affecting the course of vegetational evolution, there appears a "new decisive factor"—the human influence on vegetation. It is in fact on the "too much" or "too little" assessment of the effect of this factor on vegetation that the controversy in the two schools rests.

The other alternatives with minor or major bearing on the problem have lately been suggested (MORRISON 1958, SMITH 1961), and amongst these the suggestions of SMITH (1961, p. 47) are the most valuable. He seeks to draw our attention to the cumulating effect of the interaction of factors on vegetation, which vary in their effect from region to region.

A critical appraisal of the present position of the problem, now about 20 years old, impresses upon us a planned and systematised approach to the problem which has developed numerous facets during this long period of 20 years. The signs of progress become encouraging and hopeful if one is not influenced by the "overriding and universal importance" of one factor only especially in the context of the problem under discussion. In this systematised approach, it is very likely that we may have to begin with some of the basic aspects of the problems which we normally think

deserve an adequate interpretation. The increase of *Pteridium* together with the increase in culture pollen may be due to edaphic factors as well as due to the agricultural practice.

In some published diagrams, the cereal pollen appears first unaccompanied by the other culture pollen and unaccompanied by a rise in the curve of Gramineae and sometimes its appearance is not accompanied by a decline in the mixed oak woods, or even in the elm pollen curve. Quite a few circular arguments have been advanced to explain it suggesting obviously that the real significance of this has not been understood yet. Very likely through mutual consultations the real significance of such anomalous cases can be understood.

### F. Other Facets

Some other alternative interpretations for the Postglacial elm decline have been suggested such as fire, persistent disease, changes in soil conditions resulting from mutual competition of the plant species, *etc.*

The incidence of fire can be detected from stratigraphy. Attempts should be made through the identification of those subfossil insects and spores of fungi which attack particular species and their effects, if any, could be assessed. The changes in soil conditions induced by mutual competition of different species to the disadvantage of others require considerable study in the modern forests so as to assess the effect of this factor on vegetational changes indicated by the pollen curves. Further attention should be paid to the degree to which these factors effect vegetation and the extent to which they affect regeneration of the same vegetation type or the species concerned. The role of animals and birds in destroying the seeds and fruits and by browsing, eating seedlings, trampling *etc.* and thereby adversely affecting regeneration to the advantage of the competing species cannot be overlooked. Because of the limitations of the pollen diagrams, the role of some of the insect-pollinated shrubs, weeds and heavy undergrowth tending to prevent or impede natural reproduction of trees, owing to their dense growth, may never be detected.

It is hoped that some of the suggestions given above will be of use to the various workers in this field of research and will help in bridging the gap between the conflicting views regarding the interpretation of the Postglacial elm decline or the Atlantic/sub-Boreal transition.

### REFERENCES

- IVERSEN, J., 1941: Landnam i Danmarks Stenalder. Danm. Geol. Unders. II R. No. 66, p. 463-83.  
— 1960: Problems of the Early Postglacial Forest Development in Denmark. Ibid. IV R. No. 3, p. 1-32.  
MORRISON, M. E. S., 1959: Evidence and interpretation of "landnam" in the north-east of Ireland. Bot. Notiser. No. 112, p. 185-203.  
SMITH, A. G., 1961: The Atlantic Sub-Boreal Transition. Proc. Linn. Soc. London. 172 session, 1959-60. Pt I: 38-49.  
TROELS-SMITH, J. 1960: Ivy, Mistletoe and Elm Climate Indicators—Fodder Plants. Danm. Geol. Unders., IV R. No. 4, p. 1-30.

have no prospects or the attempts would be in vain. But it is quite certain that with our advanced knowledge and improved techniques there may be quite a few surprises that might revolutionise our concepts.

Below are discussed some of the facets of the problem, which need early attention.

### A. Pollen morphological facet

#### 1) *The identification of the cereal pollen*

It may seem too much to suggest the reinvestigation of the stray cereal pollen discovered before and during each landnam phase. But it would certainly help to standardise a uniform method for the recognition of the cereal pollen grain. There are quite a few grasses which produce pollen grains of the cereal type (ERDTMAN 1943, p. 59) which are indistinguishable from those of the cereals under light microscopy. My own experience with the pollen of the British and Indian grasses reveals that the size, the nature of the pore and rim, the ratio between their diameters and shapes of the grains etc. may often be unreliable in attributing the grass pollen between the size range of 40–50  $\mu$  to the cereal type.

#### 2) *Pollen morphology of various elm species*

Some attention seems to have been paid (TROELS-SMITH 1960, p. 20) towards the distinction of various species of elm from their pollen, the statistical approach and the construction of bimodel curves, if attempted, may be additional help. This would be of great importance in not only recognising the Postglacial species of elm but also in arriving at the precise climatic interpretation of the elm decline.

Such attempts should be extended to the other tree genera also.

### B. Pollen-analytical facets

#### 1) *The relative increase or decrease of the pollen curves*

The real significance of the relative decrease, for instance, of *elm* and *Tilia* and the corresponding increase in oak, birch, *Fraxinus* and the herbaceous elements may be explained ecologically as Iversen has done (IVERSEN 1960) but does it really suggest the factual increase of these, as often interpreted, or merely a relative one?

Further the decline in the frequency of some trees such as elm and lime may be more significantly brought out statistically especially in relation to the increase in culture pollen.

Furthermore for the compensation of the pollen frequencies of the low and high pollen producers and the inclusion of some and the exclusion of the others from the total pollen sum a more or less uniform method should be attempted and the results compared with the hitherto adopted variable methods for the calculation of the pollen sum.

A unanimous approach to this will be most favourable for the proper solution of the problem.

### C. Ecological facet

In keeping with the ecological interpretation of the pre-Postglacial pollen diagrams, the Postglacial vegetational sequence should also first be interpreted ecologically. Much attention should be paid to this factor at the first Landnam phase would be quite advisable because that is the earliest evidence of Man's change-over to the earliest form of civilization from his wild habits. But this does not mean that the first Landnam phase in each country would be equally the earliest as that in the other country. That human migrations were quite frequent during the stone age cannot be overlooked, since the archaeologists can furnish ample evidence to prove that. In view of that the first landnam phase may be the earliest human interference with vegetation in one country or experienced Neolithic Man's interference in another, though the first in that country. The assessment of the facts in the ecological perspective may be helpful in detecting that.

The climatic indicators—The climatic indicators amongst the plant species such as *Hedera*, *Viscum* etc. should be established in each country. The climatic demands of *Hedera* and *Viscum* in one country may not necessarily be the same as in other countries, or else it should be proved that the same plant species responds uniformly to climate in all the countries.

### D. Agricultural facet

This is an even more important aspect of the problem and one ought to consider all the available information regarding the primitive farming and pastoral activities of Man. It would further be advisable to know if the earliest agricultural activity of Man was pastoral or arable. Obviously it was arable since for the earliest man to settle down to the habit of food production from that of food gathering, farming would have been the natural response. It has already been pointed out above that the first landnam phase in each country may not necessarily be the first human effort towards a settled life. A careful and comparative consideration of first landnam phase in each country is likely to bring out quite a few surprises regarding the progressive development of the most primitive agricultural practices which were arable in one and pastoral in the other and probably both in yet another place. This sort of work should first be confined to one country and then extended to the others. During their migratory life, the stone-age folk would have learnt much from their earliest trial and error method that would have improved their later methods to a great extent. How far can we infer them from the pollen analyses depends largely upon our ingenuity.

The various vegetational stages in which the landnam phase manifests itself need an elaborate explanation in terms of agricultural practice, particularly when a good deal of variation is noted in different pollen diagrams.

### E. Ethnobotanical facet

#### 1) *Evaluation of the ethnobotanical data*

This constitutes an aspect of the agricultural facet but since it has been given great importance in the discussions on the Postglacial vegetational development, it deserves to be considered separately.

It concerns largely the preferential liking of the domesticated animals for some fodder plants. It must be remarked that least attention has been paid to their preferential liking for fodder plants under both the normal and abnormal conditions. Furthermore the proper assessment of the animals departure from their usual habit under abnormal conditions, it may be pointed out, has not received the attention it deserves. A critical appraisal of the historical evidence, some of dating from as early as the middle of the first Millenium BC., of the use of ivy, mistletoe and elm etc. as fodder plants, suggests that their use as fodder plants was only during adverse conditions such as famine or drought. This would indirectly mean a climatic change largely responsible for not only initiating the decline of elm and the other related forest constituents but also compelling prehistoric Man to resort to this unusual method of providing fodder for his domesticated animals.

That the collection of twigs, bark and leaves of elm, ivy and mistletoe might have been done to provide fuel during the unfavourable period in the year is yet another explanation of it which has hardly been mentioned.

That the practice of this kind was in vogue during the prehistoric period can hardly be denied. That it was more or less uniformly practised in all parts of Western Europe may also not be denied. If the earliest landnam phase is more or less synchronous in all the countries in Europe, the ethnobotanical argument would certainly support the climate as a factor responsible for the elm decline (or for the decline in beech).

#### 2) *The understanding of the role of the herbaceous elements in pollen-analyses.*

The key to this problem probably lies in understanding the correct significance of the pollen curves and frequencies of Gramineae, Cerealia, *Plantago lanceolata* and *Plantago major*, *Artemisia* and composites and probably *Pteridium* also. Broadly speaking the presence of some of them would certainly signify the practice of agriculture, as has been inferred hitherto. But that is not all. We need to differentiate between the pastoral activity from that of arable. *Plantago lanceolata* has been given the credit of being an indicator of farming, but it may be that *Artemisia* is of superior or equal value. A scrutiny of the weeds of cultivated fields and of pastures will certainly settle this point. The pollen of *Artemisia* in the pollen analyses from special habitats such as from the coastal regions may be attributed to *A. maritima* or *A. absinthium*, but its presence in other sites may be due to *A. vulgaris*—a wasteland species and not a constituent of pastures or grasslands. Its increase together with plantain needs a careful consideration. Further the increase in both and the relative decrease in the curve for Gramineae seems to