Macroscopic Plant-Remains from Karewa Deposits of Kashmir 259

Leaves of the Betulaceae, whether living or fossil, are not difficult to determine but to assign female cones to their respective species is a very hard task, especially when the latter occur as small fossil fragments. The modern female cones of the two species of *Betula* are distinguished from each other by the nature of fruiting bracts, which are deeply 3 lobed in *B. utilis* D. Don., whereas in *B. alnoides* Buch-Ham. the bracts are slightly two lobed. The size of the modern female cones of the two species of *Alnus* varies a good deal and the species can be separated from each other on this character alone; the cones measure 1–1·3 inches in length in *Alnus nitida* Endl., while their size in *Alnus nepalensis* D. Don. ranges between ·5 and ·8 inch.

Our fossil cones are not only fragmentary but are rather poorly preserved and do not show much structural detail. They occur in the clay in a longitudinal plane. Two cones of *Alnus*, which were slightly better preserved than the rest, were ground to show up some details of structure in a longitudinal section. One of them, being too brittle and soft, was partly lost in grinding while the second specimen was successfully ground to show up some structure, which is brought out in a photograph in Pl. XXI, Fig. 21.

In the year 1910 the late Middlemiss (1911, p. 122) recognised among his collections from Liddarmarg two leaves of *Alnus*, which have now been specifically determined by the author as *Alnus nepalensis* D. Don. The late Dr. S. K. Mukerjee (see de Terra and Wodehouse, 1935, p. 2) also recognised in de Terra's collections of 1932 a few leaves of *Alnus* from the same locality, which are also identified by the author with *A. nepalensis* (Puri, 1941, p. 8).

**Key to the Genera**

I. Leaves serrate, cones large and elongated .......... *Betula* (i)
II. Leaves entire, cones small and oval ................. *Alnus* (ii)

1. Leaves
   (i) Genus *Betula* Linn.

This genus includes two distinct fossil species, the modern representatives of which occur at the present time in the Himalayas; there are two more leaf fragments, which are undoubtedly referable to this genus but they do not seem to match any modern species of *Betula* that grows to-day in the Himalayan region.

The cones could not be referred to either of the two modern species, on account of their fragmentary nature and the reasons outlined above.
In addition to leaves and cones a few specimens of thin outer coverings from the bark of *Betula* sp. are also described here. These specimens being badly preserved do not show any cellular structure; hence it has not been possible to identify them with any modern species of *Betula*, although they show a good deal of resemblance to *B. utilis*.

**Key to the Species—**

I. Leaves small, oblong ovate . . . *B. utilis* and *Betula* sp. A.  
   (i) Secondaries fewer, 6-7 pairs, arising wide part . . *B. utilis* (1)  
   (ii) Secondaries, 10-11 pairs, closely situated . . *Betula* sp. A (3)  

II. Leaf large, ovate, secondaries many, 18-19 pairs . . *B. alnoides* (2)  
   (1) *Betula utilis* D. Don.  

(Plate XIX, Figs. 1, 2 and Pl. XX, Figs. 7, 8)

Plate XIX, Fig. 1 is a natural size photograph of a leaf fragment, which is about half of the leaf representing one side of the midrib only, the other part of the lamina being greatly damaged on the margin as well as apex and base. It is well preserved regarding details of venation and measures 1·34 inches by .9 inch in size. The leaf lamina probably had an ovate outline with a broad base and acute apex. Comparison with a living leaf (Pl. XIX, Fig. 2) of this species shows that the above description of the fossil leaf is not far from satisfactory. A small curved petiole, which is .3 inch long, is also preserved in the fossil. Another fragment assigned to this species is illustrated in a natural size photograph No. 7 on Plate XX. This, too, is equally badly preserved but shows an acute apex and serrate margin, for which it is figured here.

The venation is strict-pinnate and reticulate. A strong midrib runs in the fragment slightly thinning out in the upper part. 5 to 7 secondaries, which are almost half as thick as the midrib, arise on either side in an opposite, sub-opposite or alternate manner at irregular distances and diverge in the lamina making acute angles with the midrib. The lowermost secondary on the right-hand side in one fossil fragment (Pl. XIX, Fig. 1) gives off two small and thin branches. Two or three other basal secondaries also give off thin branches close to the margin and the latter, being as thin as the tertiary ribs get mixed and even lost in the meshes of the tertiary reticulations. The teriaries are likewise thin, but conspicuous; they run irregularly in the area occupied by the two laterals forming large rectangular meshes, which are well brought out in a part of the leaf (Pl. XX, Fig. 7) enlarged to five diameters in another photograph (Pl. XX, Fig. 8). There is a finer reticulation, which consists of a network of small oval meshes; these being poorly preserved are not brought out satisfactorily in the photographs.