Primula scotica Hook., a Relict Species in Scotland

BY

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SUMMARY

Published somatic chromosome numbers are confirmed for *Primula farinosa* L., *P. scotica* Hook., and *P. scandinavica* H. G. Bruun. Repeated attempts to hybridise these species failed. Re-examination of a seed (K 3713) from a Quaternary deposit in Cambridgeshire confirmed that it belonged to *P. scotica* s.s. and not to *P. scandinavica* which was separated from *P. scotica* subsequent to the identification of K 3713. *P. scotica* is therefore a relict species in northern Scotland. Another fossil seed in the same deposit (K 3714) was identified as belonging to a *Primula* of the *Eufarinosae* now extinct in Britain.

1. THE SPECIES FOR DISCUSSION.

In the genus *Primula* only two species of the sub-section *Eufarinosae* are native to Britain (Wright Smith & Fletcher, 1943). *Primula farinosa* L. is widely distributed over the Palearctic Region, is locally abundant in hill pastures and on coastal cliff tops in parts of the north of England and is very rare in a few localities in south-east Scotland. It is not known elsewhere in Britain.

Primula scotica Hook. is found some two hundred miles further north where it grows in coastal pastures and on cliff tops from a point south of Wick in Caithness, northwards and westwards to Cape Wrath in Sutherland. It is abundant on many islands of the Orkney group and is endemic to the region described.

P. farinosa is not known in Norway, but a plant closely allied to *P. scotica* is found in two regions of Norway and adjacent parts of Sweden. Fries (1842, p. 18) named the Scandinavian plant *P. scotica* and it continued to be so called until Bruun (1938) described it as *P. scandinavica*. Although the Scottish and Scandinavian plants are morphologically distinct from *P. farinosa* they are similar to each other in most macroscopic features and the basis of separation is rather critical.

2. CYTOLOGY.

Bruun (1932, p. 55) found the three species to have different somatic chromosome numbers with *P. farinosa* 2n=18, *P. scotica* 2n=54, and *P. scandinavica* (which at that time he called *P. scotica* auctt. scand.) 2n=72. In respect of the base number of 9, *P. farinosa* is diploid, *P. scotica* is hexaploid, and *P. scandinavica* is octoploid. *P. farinosa* is known to occur in a tetraploid form in parts of Sweden (Davies, 1953), but this form is rare or absent in Britain. More than one hundred collections of *P. farinosa* made in the north of England in 1952 by Miss Davies and the writer were all diploid and showed no variation from the somatic number of 18. In addition, absolutely clear counts have been made on six collections of *P. farinosa* from

Europe, eight collections of *P. scotica* from Caithness, Sutherland and Orkney, and three collections of *P. scandinavica* from Norway. Within each species there was a high degree of uniformity and all counts agreed with those quoted by Bruun. There is therefore firm evidence of cytological stability, and in particular there is valuable reinforcement for the initial cytological counts, for the morphological data, and the facts of geographical distribution on which *P. scotica* and *P. scandinavica* are separated.

3. The fossil material and contemporary seeds.

The cytological and geographical isolation of *P. scotica* and *P. scandinavica* and the small areas occupied by these species suggest they may well be relict species but firm evidence has so far been lacking. Cytological stability is matched by genetical isolation, for repeated attemps to cross these species have failed to produce a hybrid, although in the west of Scotland the three species form abundant seed with their own pollen.

The rich Quaternary deposits of the Barnwell Pit near Cambridge have produced many arctic plants in an excellent state of preservation, and Miss M. E. J. Chandler described *P. scotica* from a peat layer in this pit more than thirty years ago (Chandler, 1921). By courtesy of Dr. A. G. Brighton of the Sedgwick Museum, Cambridge, I have been able to examine the unique seed (K 3713), on which the identification was based. The specimen is very well preserved, has suffered no deformation, and under a microscope it is possible to see details of surface texture. When it was compared with contemporary seed of all species of *Eufarinosae* Primulas available in Scotland it was clear that the fossil had been correctly assigned to the *Eufarinosae* and with some confidence it could be referred immediately to *P. scotica* or *P. scandinavica*. Both these species have seeds which are smaller and otherwise distinct from those of the North-European *Eufarinosae* at present in cultivation. (For general description of seeds see Wright Smith & Fletcher, 1943.) Miss Chandler described K 3713 some seventeen years before Bruun separated *P. scandinavica* as a new species, and it was therefore a matter of interest to compare the fossil with contemporary seed of *P. scotica* and *P. scandinavica*.

Seed of *P. scandinavica* collected in the wild was made available by courtesy of Dr. K. Faegri of Bergen and Dr. J. Gjaervoll of Trondheim, and seed was ripened on plants grown in Scotland and collected in Norway by Miss P. Browning. Many samples of seed of *P. scotica* were collected in the north of Scotland and in Orkney.

Between the seeds of a sample and the samples of a species there was a marked degree of uniformity in size, shape, and surface texture for both *P. scotica* and *P. scandinavica*. Both these species are homomorphic and it may be noted in passing that the much larger seeds of the heterostylous *P. farinosa* are less uniform as to size. Darwin (1884) found differences in seed size and seed set between " legitimate " and " illegitimate " crosses of the two (heterostylous) forms of *P. farinosa*. As might be expected, the differences between the seeds of *P. scotica* and *P. scandinavica* are not great. There are small distinctions of size, ratio of length to breadth, angulation and surface texture which are difficult to put in terms of a formal description. Fortunately the uniformity within each species permits unmarked samples to be named correctly after some experience.

Miss Chandler named her fossil seed after comparison with contemporary seed of *P. scotica* collected by Clement Reid near Thurso (Miss Chandler in litt.), and after thorough examination of K 3713 and many samples of living seed there could be little doubt that the fossil seed did belong to *P. scotica* and not to *P. scandinavica*. *P. scotica* therefore was a native of Cambridgeshire some time during the Pleistocene Period. Further, it is unlikely that it grew at the same time in its present-day Scottish habitats, for at the time of the Arctic floras of the Cam Valley northern Scotland and Orkney were intensely glaciated. Current geological opinion is that survival of plants under these conditions is most unlikely. In Scotland today, *P. scotica* is a relict species which once enjoyed a wider distribution.

Dr. Brighton also sent another seed found by Miss Chandler in the Barnwell Pit and listed as K 3714 *Primula* sp. It is large and angular and quite distinct from *P. scotica* but very probably belonged to a member of the *Eufarinosae*. It has not been possible to match it with seed of any member of the *Eufarinosae* in cultivation in Scotland but the closest approximation is to *P. Halleri* J. F. Gmel. (*P. longiflora* All.) a European alpine species with a somatic chromosome number of 36.

Thus two members of the *Eufarinosae* grew together in the Cam Valley in Glacial times, one of them *P. scotica*, the other unknown and now extinct in Britain. This in itself is interesting; in Britain both *P. farinosa* and *P. scotica* are geographically isolated from each other and the same applies to *P. farinosa* and *P. scandinavica* in Scandinavia. "In no locality do they meet; they are ecologically different" (Bruun, 1938).

Are these polyploid Scottish and Scandinavian endemic Primulas of ancient lineage, nowadays surviving where they can find an ecological niche in areas dictated by the great ice flows, or did they evolve during the Quaternary Period from some simpler cytological type as a result of the violent selection pressure exerted by the successive glaciations? At least two species grew together in the Cam Valley and probably they were of different ploidy. Whether they were the only two members of a chain of new forms which have survived in the geological record or whether they were old species of which only *P. scotica* has survived in Britain remains a matter for conjecture.

References

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