

## THE FERNS OF PAHLGAM, KASHMIR

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PAHLGAM is a popular Hill Station on the Lidder River at an altitude of 7,200 feet. It is about 70 miles from Srinagar by motor road and may be found on the map at 34° 5' North latitude and 75° 30' East longitude. The village of Pahlgam is a small one but because of its easy access by motor road and because of its being the starting place for the annual pilgrimage to the famous Cave of Amarnath there are thousands of visitors who spend some time in the valley every summer.

There are many easy trips which may be made with Pahlgam as a base, some on foot and some on pony back. Nearby mountains rise to more than 14,000' and glacial lakes and small glaciers can be visited without much difficulty. Only a few miles to the north the pyramid of Mt. Kolahoi, surrounded by large glaciers and snow beds rises to nearly 18,000'. Evergreen forests come down to the valley floor and cover the sheltered slopes while the sunny southern hillsides are covered with grass and herbs or by such shrubs as *Berberis* sp., *Spiraea canescens*, *Indigofera gerardiana*, *Rosa* sp., *Cotoneaster*, *Plectranthus rugosus* and *Lonicera*. There is a small amount of cultivation, maize, wheat, barley, buckwheat, millets and various vegetables being raised by the villagers. There are some fine walnut trees, a few mulberries and also apples of poor quality.

The common conifers are *Pinus excelsa*, *Abies Webbiana*, *Picea Smithiana*, *Taxus baccata* and three species of *Juniperus*. The deodar is not common. The commonest broad-leaved trees are *Aesculus indica*, *Acer caesium*, *Prunus cornuta*, *Crataegus monogyna*, *Celtis australis*, *Ulmus wallichiana* and various willows.

With an altitudinal range of 7,000' there is a varied flora, both temperate and alpine. The snowfall in the winter is heavy and there is a fair amount of rain in the summer. I have collected some 720 species of flowering plants and 50 species of ferns within a day's walk of the village during the five vacations I have spent in the valley.

The rainfall is not heavy enough to develop epiphytes. The ferns are necessarily temperate or alpine and most of them are widely distributed. A few are very rare, *Woodsia alpina*, *Diplazium squamigerum* and *Asplenium septentrionale* × *Trichomanes* being examples. Nearly half of the ferns reported from the whole of Kashmir grow in the vicinity of Pahlgam.

The nomenclature followed in the present list is that of C. Christensen in his *Index Filicum* with Supplements.

## POLYPODIACEÆ

(1) *Woodsia alpina* (Bolton) Gray. Rare in rock crevices in the alpine zone.

(2) *Cystopteris fragilis* (L.) Bernh. Very common, in crevices and under rocks, both in the temperate and alpine zones.

(3) *Dryopteris Rosthornii* (Diels) C. Chr. A beautiful shuttlecock fern. This is perhaps the most beautiful of the segregates from the *D. filix-mas* complex. The rachis is very scaly and covered with shiny, black ramentæ. The pinnules are almost entire and uniform in size. Fairly common in shady forest cover.

(4) *D. Blanfordii* (Hope) C. Chr. Similar to the last. The stipes are also short. The scales are less numerous, not so dark and shiny and less acuminate. The cutting is not quite so delicate. It is also a fern of the forest floor.

(5) *D. odontoloma* (Moore) C. Chr. This is a size larger than the last two. The stipes are longer and the primary and secondary rachises are pale in colour and the scales are chestnut colour or some of the scales above the basal tuft may be darker. The fronds are twice pinnate and the general outline of the fronds is more elliptic, the pinnules are more toothed and the fronds are broader than in the last 2 species. Fairly common in the forests.

(6) *D. ramosa* (Hope) C. Chr. This is the largest and most divided of the *D. filix-mas* group of ferns. The stipes are long and of the colour of pale straw, while the scales are chestnut coloured. The fronds are usually thrice pinnate and broad at the base, the general outline being triangular. Like its relatives it is a plant of forest humus.

(7) *D. Brunoniana* (Wall.) Kuntze. This is not a forest fern but grows in patches on alpine meadows. The fronds are narrower, and less elliptic and the colour of the scales and stipes is darker than in the next species. The teeth of the pinnules are sharp.

(8) *D. barbigera* (Moore) Kuntze. This is also abundant on alpine meadows and in avalanche gullies. The fronds are very scaly and they are broad for their length.

(9) *D. Levingei* (Clarke) C. Chr. This is easily recognized by its creeping rhizome and its habitat. It grows in damp places, often among stones near streams. Common at 7-8,000'.

(10) *D. Robertiana* (Hoffm.) C. Chr. This also has thin, creeping rhizomes, but it grows in rich, shady forest cover. The fronds are triangular in outline with long, slender stipes. The Kashmir fern is intermediate between European *D. Robertiana* and *D. Linneana*. Some botanists report both species from the Himalaya and others believe that it is not worth trying to separate them in India.

(11) *D. Phlegopteris* (L.) C. Chr. Rare. Resembles the last but is easily spotted through its deflexed basal pinnæ. It is also a fern of the forest floor in shady places.

(12) *Polystichum Lonchitis* (L.) Roth. This 'Christmas Fern' has been considered rare in Kashmir but I have found it to be fairly common at 9-11,000'. Occasional about Pahlgam in the birch zone.

(13) *P. lachenense* (Hook.) Bedd. This is another hardy fern with fronds which can survive the frosts of winter. It grows in the rocks at high altitudes. Old leaf bases last for several years.

(14) *P. Prescottianum* (Wall.) Moore. This is a very common tufted fern in the alpine zone. The fronds are long and narrow, the scales are pale and the pinnæ are numerous.

(15) *P. Thomsoni* (Hook.) Bedd. Rare. Har Nag, Upper Lidder Valley. Usually like a small and more delicate *P. Prescottianum*. Large specimens are hard to distinguish.

(16) *P. aculeatum* (L.) Schott. Occasional in the drier parts of the forest below 8,000'.

(17) *Athyrium acrostichoides* (Sw.) Diels. Syn. *A. thelypteroides* Desv. A common fern in damp soil at 7-10,000'.

(18) *A. Mackinnoni* (Hope) C. Chr. Fairly common. A fine, large fern with attenuate tips to its pinnæ and long stipes 7-10,000'.

(19) *A. Filix-femina* var. *dentigera* (Wall.) Bedd. This is very common especially on the lower alpine meadows. The fronds are attenuate below, the basal pinnæ are much reduced and the bases of the stipes are black. 7-11,000'.

(20) *A. filix-femina* var. *retusa* (Clarke) Bedd. Rare in this region. Found once at Sekiwas in the Upper Lidder Valley and once at Pahlgam. The pinnules are larger and cut deeply and sharply.

(21) *A. fimbriatum* (Wall.) Moore. This is the largest and most divided of the Kashmir *Athyriums*. It is found in the upper forests at about 10,000'. As it usually fruits in September most specimens in collectiones are immature.

(22) *Diplazium polypodioides* Bl. A very large fern, occasionally found in stream beds in the forest. The young fiddle-heads are cooked and eaten. 7-8,000'.

(23) *Diplazium squamigerum* (Mett.) Christ. This is a rare fern with black, scaly stipes, a creeping rhizome and triangular fronds. Found only once in a snow gulley at about 8,500'.

(24) *Asplenium viride* Huds. This is a small, densely tufted fern commonly found in rock crevices in the alpine zone.

(25) *A. Trichomanes* L. Very common in forests from 5-12,000'.

(26) *A. septentrionale* (L.) Hoffm. Common in rock crevices, often in the sun. It is densely tufted and the pinnules are so narrow that the fern looks like grass at first glance. Usually from 7-9,000' in Pahlgam.

(27) *A. Ruta-muraria* L. I have a note to the effect that this is a Pahlgam fern but have no specimen to back it up. As it grows a few miles away in Sonamarg it is probably growing here as well.

(28) *A. septentrionale*  $\times$  *Trichomanes* Murbeck. Syn. *A. germanicum* Weis. This rare fern is supposed to be a hybrid. It grows on one large boulder at 7,200'. If it is a hybrid *A. septentrionale* is no doubt one parent, but I should think that the second parent is *A. Rutamuraria* rather than *A. Trichomanes*.

(29) *A. adiantum-nigrum* L. A handsome fern of the pine forest at 7-9,000'.

(30) *A. fontanum* (L.) Bernh. Not rare in the crevices of rocks, 7-9,000'.

(31) *A. varians* (Wall.) Hook. and Grev. Occasional in forest humus up to 9,000'.

(32) *Cryptogramma Stelleri* (Gmel.) Prantl. Not rare in shallow, rocky soil in the alpine zone.

(33) *C. Brunoniana* Wall. This is also found in the alpine zone but the fronds are tufted, the pinnules are more finely cut and the fertile fronds are taller and stiffer than the sterile fronds.

(34) *Ceterach officinarum* DC. Only found once, at about 7,500'. It is usually found at lower altitudes and in the outer, drier ranges. It has also been found in Astor and Gilgit.

(35) *Coniogramme fraxinea* (Don) Diels (*Syngamma* in Beddome). Only collected once at about 9,000' in a rocky snow gully.

(36) *Adiantum venustum* Don. Very common in the evergreen forests, 7-9,000'.

(37) *Adiantum pedatum* L. I seem to have found this beautiful maidenhair fern twice, once in the damp forest at about 10,000' on the mountain opposite to Pahlgam and once near Aru about 8,500'. A plant of damp, shady forest.

(38) *Pteris cretica* L. Found only once at 7,200'. Common at lower altitudes on the outer ranges.

(39) *Pteris aquilinum* (L.) Kuhn var. *Wightianum* (Ag.) Tryon. Very common on dry sunny slopes up to 10,000'.

(40) *Polypodium Stracheyi* (Ching) C. Chr. Syn. *P. Stewartii* Clarke. Gregarious on cliffs at about 10,000' on the mountain opposite Pahlgam. Not reported from any other locality in Kashmir.

(41) *Polypodium clathratum* Clarke. Fairly common in crevices of cliffs up to 12,000'. Clarke's types were from Kashmir and the thin textured epiphytic 'clathratums' from further east may be different. Pahlgam specimens are very variable in size, from 2" long to about 8" in length. They are less acuminate, thicker in texture, the veins being harder to see and dry a different green.

(42) *Polypodium Thunbergianum* Klf. The linear leaved Polypodiums which Ching refers to the genus *Lepisorus* are very hard to distinguish and need more study. Probably the types must be seen before they can be disentangled. My 8323 seems to match a specimen of De Vol's from China. The fronds are thick and xerophytic and the

sori are large covering the full width of the fronds from their tip to about half way down. Without clathrate scales.

(43) *Polypodium lineare* Thunb. Occasional and much like the last but sori are smaller and do not touch the costæ or the margins. Several specimens in the Gordon College Herbarium seem to belong here including Trotter, 403 from the East Lidder at 9,000', my 8278 from Lidderwat at 9,000' and my 8277 from Mt. Kolahoi.

(44) *Polypodium* near *excavatum* Bory. Pahlgam specimens, e.g., my 8253; 9166  $\frac{1}{2}$  and Kohli, 138, from Mt. Kolahoi resemble in outline the typical epiphytic 'excavatus' which are so common further east. The fronds tend to be smaller, thicker in texture, so that it is hard to see the veins and the scales on the rhizome are less acuminate and darker in colour. Are the differences due to the fact that these are lithophytes rather than epiphytes?

## OSMUNDACEÆ

(45) *Osmunda claytoniana* L. Gregarious on hillsides and in forest blanks, 9-11,000'.

## OPHIOGLOSSACEÆ

(46) *Ophioglossum vulgatum* L. Rare in grass at 7,500'.

(47) *Botrychium lunaria* (L.) Sw. No. 9232; found once in forest at 7,500'. Usually found at higher altitudes.

(48) *B. virginianum* (L.) Sw. Rare. I found this once at 7,200' and there is a Pahlgam specimen in the collection of Canon Stokoe of Srinagar. I do not think that var. *lanuginosum* grows in Kashmir.

## EQUISETACEÆ

(49) *Equisetum arvense* L. Fairly common near water. Dimorphic. The fertile shoots come up soon after the snow melts.

(50) *E. ramosissimum* Desf. Occasional. Large specimens are leaners in low undergrowth, 7-8,000'.

## SELAGINELLACEÆ

(51) *Selaginella Aitchisoni* Hieron. Gregarious on shady cliffs, Stewart 5959.

(52) *S. sanguinolenta* (L.) Spring. Cliffs in forest at 7,000'.

The following ferns have been collected near Pahlgam and so may have been overlooked:

(1) *Cystopteris montana* (Lam.) Bernh. Stewart 6868, Sonamarg at 10,500'.

(2) *Dryopteris serrato-dentata* (Bedd.) Hayata (*D. Filix-mas* var. *odontoloma* of Beddome). Duthie 11,613, Sind Valley near Baltal; Lidder Valley vide Hope.

(3) *Polystichum Prescottianum* var. *Bakerianum* W. S. Atkinson, Sind Valley, 12,000' Clarke.

(4) *Lycopodium Selago* L. Sonamarg, Stewart 7336 at 13,000'.

(5) *Selaginella Jacquemontii* Spring. Sonamarg, Stewart 6660, 7368 Mahadeo, Stewart 7133.

#### DUBLÆ

*Dryopteris Filix-mas* (L.) Schott. According to Hope the typical form grows in Kashmir, Trotter 404 Lidderwat.

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