

THE VEGETATION AROUND JUMNOTRI IN TEHRI-GARHWAL, U.P.

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ABSTRACT

The distribution of vegetation in the altitude range, 1500 to 3500 metres and the composition of the main *Rhododendron campanulatum*—*Betula utilis* and *Abies spectabilis*—*Betula utilis*—*Quercus semecarpifolia* forests as observed by the author during a recent plant collection tour in the Jumnotri area of Tehri-Garhwal Himalayas are described in the paper. The herbaceous vegetation in the forests is very rich and many monocotyledonous species are represented. The paper includes an enumeration of the plants collected during the tour.

The Northern Circle of the Botanical Survey of India has been conducting botanical explorations in the western Himalayas during the past few years. As part of this programme, the author recently visited the Jumnotri area of Tehri-Garhwal in Uttar Pradesh. In addition to making collections for the Regional Herbarium and the Central National Herbarium, opportunity was taken to study the altitudinal distribution of vegetation and also the composition of certain vegetational types met with in the area. The survey extended over the range of altitude, 1500 to 3500 metres in the area lying between 30°45'–31°15' N., and 78°15'–78°30' E., as far as north as the gorge beyond the shrine of Jumnotri. The river Jumna (Yamuna) takes its origin in the glacial zone above and falls vertically down and then flows through the gorge in a southerly direction. The valley is very narrow along the course of the river and on either side the hill slopes are thickly wooded with *Quercus semecarpifolia* in association with *Betula utilis* and *Abies spectabilis*. The brownish aspect of the foliage of the Oak along with the bright green leaves and ashy white bark of the Birch attract attention even from a distance. In the neighbourhood of the Jumnotri temple, located at an altitude of nearly 3300 metres, numerous hot springs flow out from the rock crevices, and mats of blue green algae are conspicuous on the rock surfaces washed by the hot water from the springs whose temperature may be as high as 80°–90°C. To the north-west of the valley lie the glacial beds along which on the slopes, another characteristic plant association occurs, that a *Betula utilis*–*Rhododendron campanulatum*. On account of exposure and strong winds and snow storms from the north, the *Rhododendrons* present a marked wind-swept appearance in the direction of the slopes. This Birch–*Rhododendron* forest has been classified by Champion (1936) as one of the two climax forests met with in the sub-alpine zone of western Himalayas, the other being the Fir–Birch forest with *Quercus semecarpifolia*. Reference may also be made in this connection to the recent publications of Gupta (1962 and other papers cited therein) on

the vegetation of some other localities of Tehri-Garhwal.

In the Birch–*Rhododendron* forests, in addition to the two dominants, other smaller trees and shrubs are conspicuous; these are *Salix elegans*, *Sorbus foliolosa*, *Ribes rubrum*, *Viburnum cotinifolium* and others. On the exposed slopes near the forest are found shrubs of *Rosa macrophylla*. The herbaceous vegetation during the month of June, when this study was made, was very rich; the following species occur in abundance: *Smilacina purpurea*, *Clintonia alpina*, *Trillium govanianum*, *Valeriana jatamansii*, *Geum elatum* and others. On the neighbouring slopes, patches of *Polemonium coeruleum* with attractive bluish flowers are seen. Near the glacial bed and on the neighbouring slopes and rocks are seen *Lloydia serotina*, *Potentilla ambigua*, *Viola biflora*, *Hackelia glochidiata* and others. Close to the glacial beds occur patches of *Caltha palustris*, *Osmunda claytoniana* and *Dryopteris brunonianum* are two conspicuous ferns on the slopes at the edge of the forest.

Below the Jumnotri gorge there is an extensive Fir forest in which *Quercus semecarpifolia* and *Acer* species occur as associates. Among the smaller trees in the forest, *Prunus cornuta* and *Syringa emodi* may be mentioned. The latter is conspicuous during the summer months with its fragrant, white flowered panicles. Among the shrubs, the pink flowered *Spiraea bella* and the purple flowered, aromatic *Rhododendron lepidotum* are prominent. The undergrowth is again very rich here. There had already been some summer showers and even at the time of our visit in June there was rain almost every afternoon. The vegetation was therefore lush, and large dissected fronds of *Thalictrum reniforme* and the curious inflorescences of *Arisaema wallichianum* could be seen everywhere. There were also many liliaceous members and ground orchids. On steep rocks are found species of *Androsace*, *Anemone*, *Potentilla* and others. The most conspicuous climber at altitudes around 3000 metres is *Clematis montana* with large white flowers.

Descending below 3000 metres, *Rhododendron*

arboreum appears and in several places, it is the dominant tree of the forest. *Lyonia ovalifolia* is an invariable associate and often the climbing *Schisandra grandiflora* with white fragrant flowers (uni-

interesting find in the Pine forest undergrowth was *Cymbidium macrorhizum*, the only leafless terrestrial species among the Indian Cymbidiums.

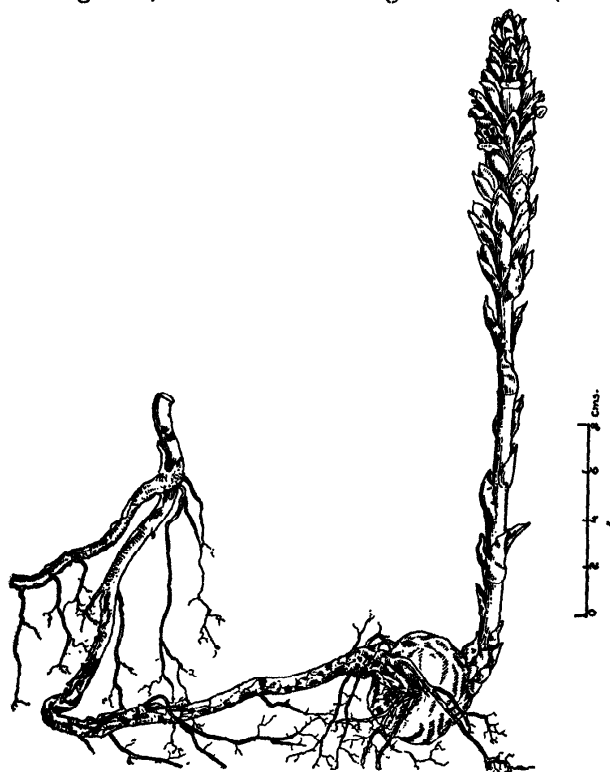


Fig. 1. *Boschniakia himalaica* Hook. f. & Thoms.

sexual) is seen. The root parasite, *Boschniakia himalaica* is occasionally seen in contact with roots of *Rhododendron arboreum* (Fig. 1). The *Rhododendron* forest continues down to 2000 metres and in some places *Quercus dilatata* is found. A grove of *Cedrus deodara*, considered to be the oldest plantation dating back to the 19th century, was seen near the village Shanchatti (2025 metres). Near this place were also seen species of *Buxus*, *Aesculus* and *Acer* among trees, *Holboellia latifolia*, a climber of the Lardizabalaceae and an interesting association of *Paeonia emodi*—*Aconitum laeve*, both of which had fruited. *Rosa sericea* with large white flowers and *Spiraea canescens* with arching branches closely set with corymbs of white flowers were most showy and abundant throughout the altitude range, 2000 to 3000 metres. As rain had already set in, the herbaceous vegetation was very rich in which *Roscoeia alpina*, *Disporum cantoniensis*, *Polygonatum cirrhifolium*, *Dioscorea deltoidea* and *Bupleurum lanceolatum* were prominent. The collection also included exceedingly nice specimens of *Cypripedium cordigerum* (Fig. 2) and *Lilium polyphyllum*.

At altitudes below 2000 metres, excellent forests of *Pinus roxburghii* are seen in some places. An

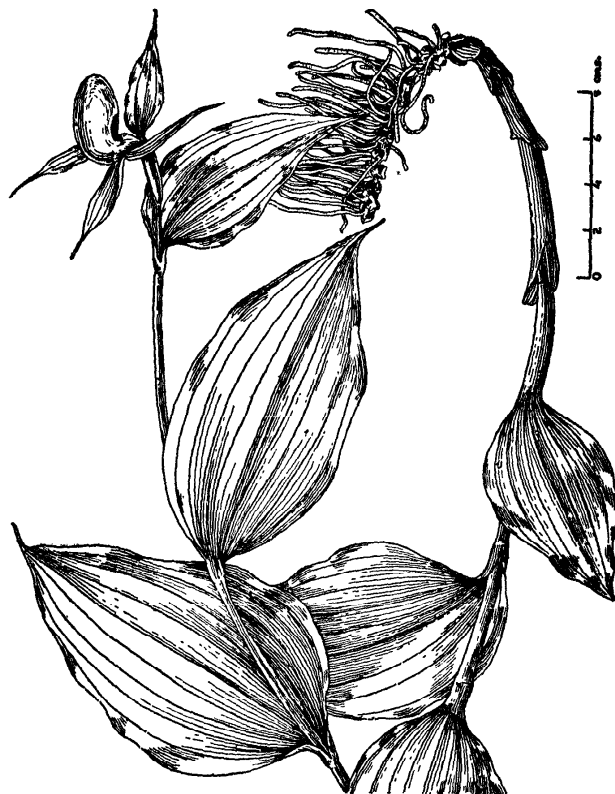


Fig. 2. *Cypripedium cordigerum* D. Don

The plants collected during the tour are listed here in two series, one consisting of those collected in the altitude range, 1500—2500 m. and the other at 2500—3500 m. The names are arranged in alphabetical order and all specimens have either flowers or fruits or both and in the case of ferns, sori. The specimens have been deposited in the Herbarium of the Northern Circle, Botanical Survey of India at Dehra Dun and in the Central National Herbarium at Calcutta.

ENUMERATION

Altitude 1500—2500 m.

Acer villosum Wall.
Aconitum laeve Royle
Androsace lanuginosa Wall.
Anemone obtusiloba D. Don
Aquilegia pubiflora Wall. ex Royle
Arisaema tortuosum Schott
Asparagus filicinus Buch.-Ham.
Berberis aristata DC.
Berchemia edgeworthii Laws.
Bupleurum lanceolatum Wall.
Buxus wallichiana Baill.
Calanthe tricarinata Lindl.
Corallodiscus lanuginosus (Wall. ex DC.) Burtt

Cymbidium macrorhizum Lindl.
Delphinium denudatum Wall.
Deutzia corymbosa R. Br.
D. staminea R. Br.
Dioscorea deltoidea Wall. ex Kunth
Disporum cantoniensis Merr. (= *D. pullum* Salisb.)
Elatostema sessile Forst.
Erysimum hieracifolium Linn.
Euphorbia pilosa Linn.
Geum urbanum Linn.
Holboellia latifolia Wall. var. *angustifolia* Hook. f.
Hydrangea altissima Wall.
Hypericum dyeri (Wall.) Rehder
Hypoxis aurea Lour.
Indigofera atropurpurea Buch.-Ham.
Jasminum dispernum Wall.
J. officinale Linn.
Lactuca dissecta D. Don.
Lilium polyphyllum D. Don.
Lonicera angustifolia Wall. ex DC.
Lysimachia pyramidalis Wall.
Marsdenia roylei Wt.
Ophiopogon intermedius D. Don
Oreorchis foliosa Lindl.
Paeonia emodi Wall.
Parthenocissus semicordata (Wall.) Planch.
Phyllanthus parvifolius Buch.-Ham.
Phytolacca acinosa Roxb.
Randia tetrasperma Roxb.
Rhamnus virgatus Roxb. (= *R. dahuricus* Laws. non Pall.)
R. procumbens Edgew.
Rosa moschata Mill.
Rubus pedunculatus D. Don (= *R. niveus* Wall.)
Sabia campanulata Walp.
Sagina saginoides (Linn.) Karsten
Salix daphnoides Villars
Salvia lanata Roxb.
Scurrula elata (Edgew.) Danser on *Rhododendron arboreum* Sm.
Scutellaria angulosa Benth.
Smilax elegans Wall. ex Kunth
S. glaucophylla Klotz. (= *S. parvifolia* Wall.)
Spiraea canescens D. Don
Symplocos chinensis (Lour.) Druce (= *S. crataegoides* Buch.-Ham.)
Tetrastigma obtectum (Wall.) Planch. ex Franch.
Thalictrum sp.
Thlaspi arvense Linn.
Tragopogon gracile D. Don
Trigonella emodi Benth.
Typhonium diversifolium Wall. ex Schott
Verbena officinalis Linn.
Viburnum foetens Decne

Altitude 2500-35000 m.

Anemone narcissifolia Linn. var. *polyanthes* Finet & Gagn.

Aralia cissifolia Griff.
Arenaria sp.
Arisaema wallichianum Hook. f. [= *A. costatum* (Wall.) Mart. ex Schott; See D Chatterjee in Bull. Bot. soc. Bengal. 8:123. 1954.]
Barbarea vulgaris R. Br.
Berberis aristata DC. (Heavily infected with rust)
Bergenia ligulata (Wall.) Engl.
Boschniakia himalaica Hook. f. & Thoms.
Caltha palustris Linn.
Cephalanthera ensifolia Rich.
Clematis montana Buch.-Ham.
Clintonia alpina Kunth
Cotoneaster sp.
Cynanchum vincetoxicum Pers.
Cypripedium cordigerum D. Don
Doronicum roylei DC.
Dryopteris brunonianum (Wall.) O. Kze.
Ephedra gerardiana Wall.
Epilobium roseum Schr.
Fragaria vesca Linn.
Geum elatum Wall.
Hackelia glochidiata (A. DC.) Brand
Jasminum humile Linn.
Lloydia serotina Reichb.
Lonicera angustifolia Wall.
Nomocharis oxypetala (Royle) Balf. f.
Oreorchis sp.
Osmunda claytoniana Linn.
Paris polyphylla Sm.
Plantago sp.
Picrorhiza kurrooa Benth.
Podophyllum emodi Wall.
Polemonium coeruleum Linn.
Potentilla ambigua Camb.
P. atrosanguinea Lodd.
Prunus cornuta (Royle) Steudel
Rhododendron arboreum Sm.
R. campanulatum D. Don
R. lepidotum Wall.
Ribes rubrum Linn.
Rosa macrophylla Lindl.
Roscoeia alpina Royle
Salix elegans Wall. ex Anderss.
Saxifraga sp.
Schisandra grandiflora Hook. f. & Thoms.
Sedum rosulatum Edgew.
S. rhodiola DC.
S. tibeticum Hook. f. & Thoms. var. *stracheyi* Hook. f. & Thoms.
Smilacina purpurea Wall.
Sorbus foliolosa (Wall.) Spach
Spiraea bella Sims
Syringa emodi Wall. ex G. Don
Trillium govanianum Wall.
Valeriana jatamansi Jones (= *V. wallichii* DC.)
Veronica laxa Benth.
Viburnum cotinifolium D. Don
Viola biflora Linn.
V. serpens Wall.

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